Association Between Superficial Vein Thrombosis and Deep Vein Thrombosis of the Lower Extremities

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**Objective:** To evaluate the occurrence of deep vein thrombosis (DVT) in patients with superficial vein thrombosis (SVT).

**Design:** A prospective study in patients with sonographically proven SVT.

**Setting:** Outpatient department of the Department of Dermatology, Medical University of Graz.

**Patients:** Forty-six consecutive patients with superficial vein thrombosis were enrolled.

**Intervention:** Every patient underwent color-coded duplex sonography of both lower extremities at the beginning of the study.

**Main Outcome Measures:** Important risk factors (eg, history of thromboembolic events, recent immobilization, active malignant disease, and the use of oral contraceptives) were investigated.

**Results:** In 24% of our patients, a concomitant, mostly asymptomatic DVT was found. In 73% of these patients, the DVT occurred in the affected leg, in 9% in the contralateral leg, and in 18% in both legs. The calf muscle veins were most commonly involved. In all patients with DVT, the SVT was located on the lower leg and the D-dimer findings were positive.

**Conclusions:** Superficial vein thrombosis is not a life-threatening disease, but the risk of concomitant DVT cannot be ignored. Color-coded duplex sonography should be performed in patients with SVT to rule out DVT.

*Arch Dermatol. 2009;145(7):753-757*

**SUPERFICIAL VEIN THROMBOSIS (SVT) is a common disease that most often affects the veins of the leg but can also be found in other locations. The great saphenous vein is involved in 60% to 80% of cases, and the small saphenous vein in 10% to 20%.

Little data are available concerning the incidence of SVT from only few studies reported in the literature. The Tecumseh Community Health Study reports an incidence of 0.05 per 1000 men per year and 0.31 per 1000 women per year during the third decade of life, increasing to 1.8 per 1000 men per year and 2.2 per 1000 women per year during the eighth decade of life. Most studies have revealed predominance in women (50%-70%) with a mean age around 60 years.

Different risk factors for developing SVT have been reported: varicose veins, thrombophilia, oral contraception use, immobilization, malignancy, direct trauma, or a history of thromboembolism. These are the same risk factors as for deep vein thrombosis (DVT). In the past, not much interest has been focused on SVT because of its generally benign course. However, recent investigations showed an unsuspected association of SVT with DVT and thromboembolism. According to the literature, the prevalence is between 3% and 65% for DVT, while up to 33% of patients have been described as having pulmonary embolism. In most cases, the DVT appears in the same limb as the SVT, but in some cases (2%) the DVT develops in the contralateral limb. This association may be explained by a state of hypercoagulability or by progression of the thrombus toward the deep venous system via the saphenous-femoral or saphenous-popliteal junction or via a perforating vein. Hypercoagulability might explain the noncontiguous coexistence of the 2 types of thrombosis. Routinely performing color-coded and compression ultrasonography of the deep veins, especially if the clinical signs of SVT affect the great or small saphenous vein, allows one to exclude or detect concomitant DVT.

Several published studies addressing SVT and DVT deal with the development
of DVT in the affected limb. In our present prospective study of an outpatient population with ultrasonographically confirmed SVT, we investigate the incidence of DVT in both lower extremities by performing color-coded duplex sonography of the deep venous system there, and we analyze the risk factors that might contribute to the development of DVT.

METHODS

PATIENTS

Patients referred to our phlebology outpatient clinic showing clinical signs of SVT were included in this prospective study. From November 2006 to June 2007, 46 consecutive patients with SVT were enrolled: 32 women and 14 men (age range, 19–91 years; median age, 65 years). All patients were asked about a history of thromboembolic events (DVT or pulmonary embolism), grade of immobilization according to the Braden scale,10 active malignant disease, current use of oral contraceptives, and the use of compression stockings.

When they first presented in our outpatient department, all patients underwent color-coded duplex sonography and compression ultrasonography of all venous segments (from groin to ankle) of both lower limbs—regardless of clinical symptoms of DVT—to confirm the diagnosis of SVT and to detect or exclude DVT. The localization and extension of the SVT and/or DVT (the proximal end of the clot) were determined to categorize the cases into the following groups: SVT of the great saphenous vein, the small saphenous vein, the branches of the great saphenous vein or small saphenous vein, and combinations of these; DVT of the thigh, the lower leg (posterior and anterior tibial veins or fibular veins), the calf muscle veins, and/or perforating veins.

Laboratory studies in all patients included blood cell count; liver and renal function tests; D-dimer assay; and analysis of thrombophilic disorders such as protein C, protein S, and/or antithrombin III deficiencies, factor V Leiden mutation, and presence and/or levels of antiphospholipid antibodies (anti–β2-glucoprotein 1 antibodies, anticardiolipin antibodies, and lupus anticoagulant).

All patients gave consent for the study, and institutional rules governing clinical investigations of human subjects were strictly followed. We conformed to the Helsinki Declaration with respect to human subjects in biomedical research.

STATISTICAL ANALYSIS

The statistical analyses included the Fisher exact test and the t test to prove the hypothesis that 2 independent samples came from the distribution with equal means. A 2-tailed P value lower than .05 was accepted as significant.

RESULTS

ANALYSIS OF CLINICAL AND ANAMNestic DATA OF ALL PATIENTS WITH SVT

Table 1 summarizes the clinical characteristics of our 46 patients. The age range was 19 to 91 years (median age, 65 years). The median age of the 32 women was 72 years (mean [SD] age, 67.0 [14.5] years); the median age of the 14 men was 56 years (mean [SD] age, 53.9 [15.1] years). The body mass index (BMI), calculated as weight in kilograms divided by height in meters squared, ranged from 19.00 to 35.80 (median, 26.42); for men it was 28.42 (mean [SD] BMI, 28.34 [4.27]). All patients showed venous insufficiency with varicose great and/or small saphenous veins, the branches, and the involved perforating veins. Five patients reported that they wore compression stockings regularly (“always”); 9 patients, occasionally (“sometimes”); and 32 patients, never. None of the patients had been immobilized in the weeks before the occurrence of SVT: 42 of 46 patients scored 4 points on the Braden scale10 (no limitation of mobility); and 4 patients, 3 points (slightly limited in their mobility). Three patients had active malignant disease (7%). Only 2 patients (4%) were using oral contraceptives (Marvelon; Wyeth-Medica Ireland, Newbridge, Ireland [containing 150 µg of desogestrel and 30 µg of ethinyl estradiol]; and Harmonette; Wyeth Pharmaceuticals AG Switzerland, Zug, Switzerland [containing 75 µg of gestagen and 20 µg ethinylestradiol]). Both of these patients had been taking oral contraceptives for more than 10 years. None of the patients were receiving hormone therapy.

The duration of the clinical symptoms of SVT (a tender, painful, indurated cord along superficial veins; redness and increased temperature of the affected area) varied between 1 and 21 days. The localization of the SVT showed that the great saphenous vein was affected in 10 patients, the small saphenous vein in 5 (3 of these reached the junction), and the branches in 19. The great saphenous vein and branches were involved in 9 cases, and the small saphenous vein and branches in 2; 1 patient had SVT of the great and small saphenous veins. In 7 of 46 patients with affected great saphenous veins, the SVT reached the junction with the deep venous system. The left leg was affected more often (54%) than the right (44%), while only 1 patient had SVT of both legs. No patient presented with clinical signs of pulmonary embolism, and none developed such symptoms during the study period.

The D-dimer level was elevated in 37 of 46 patients (normal, ≤200 µg/L). In 8 of 46 patients with SVT, a heterozygous mutation of factor V Leiden was found. No other thrombophilic disorders were found (eg, protein C, protein S, and/or antithrombin III deficiencies, factor V Leiden mutation, and presence and/or levels of antiphospholipid antibodies (anti–β2-glucoprotein 1 antibodies, anticardiolipin antibodies, and lupus anticoagulant).

COMPARISON OF THE PATIENTS WITH AND WITHOUT CONCURRENT DVT

Concurrent DVT occurred in 11 of 46 patients (Table 2), with 8 DVTs found in the same leg as the SVT (24%), 1 in the contralateral lower leg (9%), and 2 in both lower extremities (18%). In 4 of 11 patients with DVT, only calf muscle veins were affected (36%); thrombosis of perforating veins was found in 5 of 11 patients (45%); and in 2 patients, thrombi were found in posterior tibial veins (18%) (Table 1).

The median age of patients with DVT was 73 years (mean [SD] age, 66.7 [15.0] years); median age of the
Six of the 11 patients with DVT reported that they wore compression stockings, 5 of them occasionally, and 1 regularly; whereas in the group without DVT (35 patients), only 8 patients used compression stockings (4 sometimes and 4 always) ($P = .04$). In all patients in the DVT group, the SVT affected the lower leg; whereas in the group without DVT, one-third of the SVTs affected only the thigh. Lower leg SVT involvement was associated with a significantly higher frequency of DVT ($P = .02$).

All patients with DVT had an elevated D-dimer level. In contrast, patients with a normal D-dimer level were found only in the group without DVT ($n=9$) ($P = .06$).

The other investigated parameters (BMI, Braden scale, oral contraceptive use, and history of thrombophilic dis-...
orders) did not show any significant differences between the 2 groups.

## Table 2. Risk Factors of the 11 Patients With DVT and 35 Without DVT

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>No DVT (n=35)</th>
<th>DVT (n=11)</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), y</td>
<td>61.9 (16.0)</td>
<td>66.7 (15.0)</td>
<td>.38</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>23</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>BMI, mean (SD)</td>
<td>27.1 (3.9)</td>
<td>27.3 (3.9)</td>
<td>.88</td>
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<td>Compression stockings used</td>
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<td></td>
</tr>
<tr>
<td>Never</td>
<td>27</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Always</td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>Braden score (0-4 points)</td>
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<td></td>
<td>&gt;.99</td>
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<tr>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>32</td>
<td>10</td>
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<tr>
<td>Oral contraceptives</td>
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<tr>
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<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>34</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Duration, mean (SD), d</td>
<td>5.63 (4.32)</td>
<td>7.91 (6.24)</td>
<td>.18</td>
</tr>
<tr>
<td>Location of SVT</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Thigh</td>
<td>13</td>
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<td></td>
</tr>
<tr>
<td>Lower leg</td>
<td>15</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Thigh and lower leg</td>
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<td>6</td>
<td></td>
</tr>
<tr>
<td>D-dimer</td>
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<tr>
<td>Normal</td>
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</tr>
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<td>Elevated</td>
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<td>Factor V Leiden</td>
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<tr>
<td>Yes</td>
<td>11</td>
<td>4</td>
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</tbody>
</table>

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); DVT, deep vein thrombosis; NR, not reported; SVT, superficial vein thrombosis.

Superficial vein thrombosis—also called superficial thrombophlebitis—of the lower extremities is a well-known and common disease, often occurring in patients with varicose veins. Most SVTs occur at ages older than 60 years. In our population, most cases were found in the group older than 60 years (29 of 46), and female patients were affected predominantly (70%). These results are in accordance with published studies.

Generally, SVT is regarded as a condition with an uncomplicated course and usually is not considered to be a severe or life-threatening disease. However, the occurrence of concomitant DVT and/or pulmonary embolism may lead to severe complications. The reported frequency for these events is very divergent, ranging between 3% and 65% for DVT and up to 33% for pulmonary embolism. In our study population, DVT occurred in 24% (11/46). Most commonly, DVT affected the ipsilateral SVT limb with isolated thrombi in calf muscle veins and DVT of perforating veins. Furthermore, in a quarter of our patients, DVT was detected in the contralateral leg, suggesting quite a high incidence of occurrence of DVT in the other leg. Different mechanisms of developing DVT in association with SVT have been discussed. In our 11 patients with DVT, 5 cases of DVT occurred by progression into the deep venous system via perforating veins; the remaining 6 patients developed DVT independently from the SVT. In our study, all patients with DVT presented with an SVT of the lower leg. This may be explained by the high number of perforating veins in this anatomic region. According to our data, SVT of the lower leg is more likely to be associated with concomitant DVT than is SVT of the thigh veins.

The D-dimer assay has proven useful in the diagnosis of thromboembolic disease; however, only a few reports have focused on the measurement of D-dimer levels in patients with SVT. Overall, more than two-thirds (37 of 46) of our patients with SVT had an elevated D-dimer level; D-dimer level was elevated in all of our patients with concomitant DVT, which suggests that in patients with SVT, a normal D-dimer finding might be useful to exclude DVT.

Surprisingly, 6 of the 11 patients with DVT reported wearing compression stockings regularly or at least occasionally before the occurrence of SVT (.04) to minimize symptoms like pain, heaviness, and swelling of the legs due to the chronic venous disorder and/or existing varicose veins. The number of patients with regular compression therapy was too small to draw any conclusions on the effectiveness of compression stockings to prevent DVT: only 1 patient in the DVT group and 4 in the other group wore the stockings every day.

Our study confirms the findings of previous studies and demonstrates that the risk of a concomitant DVT should not be underestimated in patients with SVT. The most important indicators for the development of a DVT were SVT of the lower leg and increased D-dimer levels. In addition, the older age of patients seemed to be a minor risk factor. Thigh SVT involvement and normal D-dimer test findings negatively correlated with the development of a DVT.

The results of this study indicate that concurrent DVT is more likely when SVT affects the lower leg. In these cases, the deep veins should be assessed by color-coded duplex sonography (from the inguinal region to the ankle) to exclude or confirm acute DVT. We recommend also evaluation of the contralateral leg in cases of SVT with a substantially elevated D-dimer level and any symptoms of DVT to insure the best medical care and thus hopefully prevent pulmonary embolism or postthrombotic syndrome.

**Accepted for Publication:** February 10, 2009.

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**Author Contributions:** Dr Binder had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Binder and Hofmann-Wellenhof. *Acquisition of data:* Salmoňhofer, Kroemer, and Custovic. *Analysis and interpretation of data:* Lackner and Hofmann-Wellenhof. *Drafting of the manuscript:* Binder.
Salmhofer, and Hofmann-Wellenhof. Critical revision of the manuscript for important intellectual content: Lackner, Kroemer, Custovic, and Hofmann-Wellenhof. Statistical analysis: Lackner. Study supervision: Binder and Hofmann-Wellenhof.

Financial Disclosure: None reported.

REFERENCES


Archives Web Quiz Winner

Congratulations to the winner of our April quiz, Ayesha Yacub Moolla, MBChB, Department of Dermatology, University of Stellenbosch and Tygerberg Academic Hospital, Cape Town, South Africa. The correct answer to our April challenge was dermatofibrosarcoma protuberans (DFSP), pigmented variant (Bednar tumor). For a complete discussion of this case, see the Off-Center Fold section in the May Archives (Quigley EA, Marghoob AA, Busam KJ, Chen C-SJ). A firm red-brown plaque on the arm. Arch Dermatol. 2009;145(3):589-594.

Be sure to visit the Archives of Dermatology Web site (http://www.archdermatol.com) to try your hand at the interactive quiz. We invite visitors to make a diagnosis based on selected information from a case report or other feature scheduled to be published in the following month’s print edition of the Archives. The first visitor to e-mail our Web editors with the correct answer will be recognized in the print journal and on our Web site and will also receive a free copy of The Art of JAMA II.

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