Management of Acute Isolated Soleal Vein Thrombosis in a Pregnant Patient With an Osteopathic Approach to Evaluation

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In pregnant women, the risk of venous thromboembolism increases 4 to 5 fold over that in nonpregnant women. Deep vein thromboses in the calf occur in approximately 6% of cases, with a 20% incidence of propagation, but new imaging methods suggest a higher rate. Nevertheless, the management of isolated soleal vein thrombosis is currently one of the most debated issues in the field of venous thromboembolism, and a clear set of principles for the management of this unique clinical problem remains undefined. The authors present the case of a 37-year-old woman with a history of recurrent spontaneous abortions and cervical insufficiency who presented with a short cervix and acute right isolated soleal vein thrombosis. Long-term anticoagulantion therapy was recommended. Future studies on the risk of isolated soleal vein thrombosis propagation in the setting of pregnancy are required to identify the most effective treatment options for this clinical problem.

The risk of venous thromboembolism (VTE) in pregnant women is 4 to 5 times higher than that in nonpregnant women.[1,2] During pregnancy, most VTEs are confined to the deep veins of the lower extremities, which include all of the infrapopliteal deep veins of the lower limbs. Approximately 70% of cases are located in the iliofemoral veins without involvement of the calf veins. When VTEs occur during pregnancy, more than 90% of them occur in the left leg.[3] Isolated iliac vein and calf vein thromboses occur in approximately 17% and 6% of cases, respectively.[4] Conflicting data have been reported by several studies regarding the incidence of propagation of calf vein thrombosis, specifically soleal vein thrombosis, in the proximal deep veins of the leg.[5-7] A 20% incidence is widely quoted, but new imaging methods point to a higher frequency.[8] Despite its frequency, the phenomenon of isolated soleal vein thrombosis (ISVT) is one of the most debated issues in the field of VTE, and clear guidelines for the management of this clinical problem remain to be defined, especially when concurrent with pregnancy. We present a case of a pregnant woman with a short cervix and acute ISVT.

Report of Case

A 37-year-old pregnant woman with a short cervix and a gestational age of 14 weeks presented to the Department of Obstetrics and Gynecology with right calf pain that worsened with movement. She had been referred by the Department of Maternal and

Fetal Medicine for cerclage placement. Her obstetric history was gravida 15, para 0, and aborta 13. The patient's miscarriages occurred between 12 and 14 weeks. A cerclage had been placed during her fifth pregnancy, but the patient delivered at 20 weeks. The remaining 9 pregnancies resulted similarly, with nonviable preterm deliveries before 20 weeks and gestational ages ranging between 12 and 16 weeks despite similar interventions. The most recent sonogram demonstrated a cervical length of 9 mm with funneling. Results of a workup for thrombophilic disorders were negative. The patient denied any chest pain, shortness of breath, fever, chills, or any other symptoms.

Venous duplex ultrasonography demonstrated an acute occlusive right ISVT (*Figure 1*) with no evidence of acute or chronic thromboses in the common femoral, deep femoral, femoral, popliteal, or posterior tibial veins on either side. An osteopathic structural examination performed on the thoracic and lumbar spines and lower extremities revealed that T1-9 was neutral, rotated right, sidebent left; T10-12, flexed, rotated right, sidebent right; L1-2, flexed, sidebent, rotated right; L3-5, flexed, sidebent right, rotated right; and a posterior right fibular head. The right lower extremity starting just below the popliteal fossa posteriorly was visibly more edematous than the left, and prominent TART (tenderness, asymmetry, restricted motion, tissue texture) changes were identified on the right calf.

The patient's treatment plan was discussed in an interdisciplinary manner among the departments of internal medicine, hematology, vascular surgery, and obstetrics and gynecology. The decision was made to start therapy with heparin. For the short cervix, a rescue McDonald cerclage of the cervix was favored over 17-α-hydroxy-progesterone therapy because of this patient's risk of clotting. The procedure was uncomplicated, and her fetus was found to be viable. Anticoagulation therapy with enoxaparin sodium was then initiated, prescribed to be taken throughout the pregnancy and postpartum period. She was instructed to follow up with
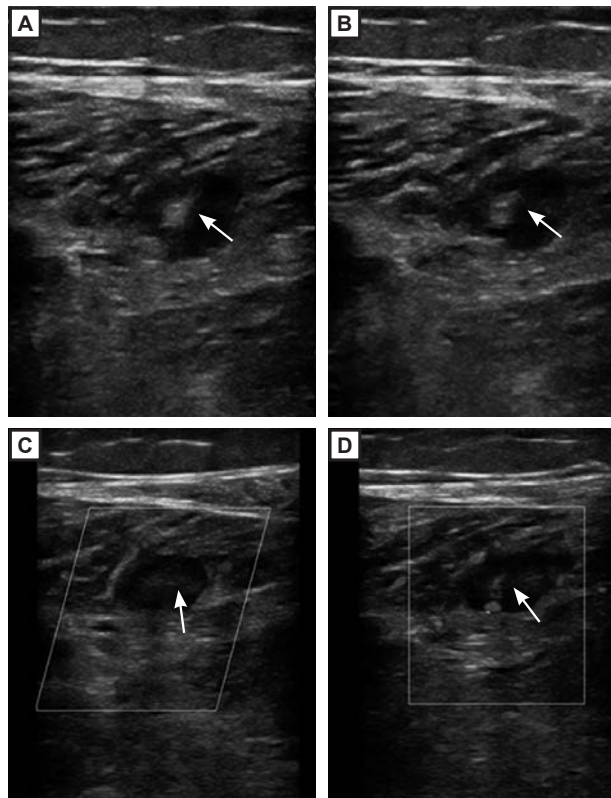

Figure 1.
Venous duplex ultrasonography of the right calf of a 37-year old pregnant woman presenting with calf pain. The arrows points to the occlusive thrombosis identified in the soleal vein.

the Department of Maternal and Fetal Medicine in 1 week and to schedule an appointment with her primary care physician.

A week later, the patient presented to the emergency department with complaints of fatigue, dyspnea on exertion, and shortness of breath. During the history-taking portion of the visit, the patient revealed that she had been unable to fill her enoxaparin sodium prescription because of an error at her local pharmacy.

An osteopathic structural examination was performed on the thoracic and lumbar spines, lower extremities, rib cage, and chest wall, which revealed
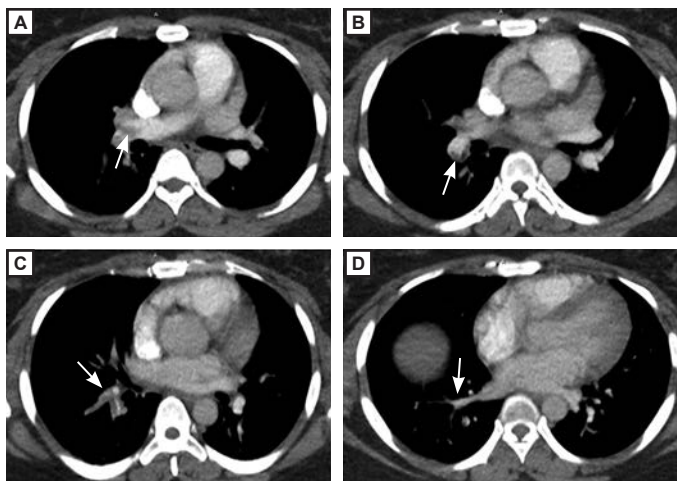
Figure 2.
Computed tomographic angiogram of the chest of a 37-year-old pregnant woman. An acute pulmonary arterial embolism with intraluminal filling defects within the distal right main pulmonary artery (A) and segmental and subsegmental branches (B, C, and D) of the right and left lower lobes was identified. The arrows point to the area of occlusion.

TART changes at T2-4 and identical right lower extremity findings as before: T1-2, neutral, rotated right, sidebent left; T3-4, flexed, rotated right, sidebent right, T5-9, neutral, rotated right, sidebent; T10-12, flexed, rotated right, sidebent right; L1-2, flexed, sidebent, rotated right; L3-5, flexed, rotated right, sidebent right, rotated right; poor cephalad movement of ribs 3 to 10 on inspiration; and an anterior Chapman reflex point at the sternocostal junction in the intercostal space between the right fourth and fifth ribs.

An electrocardiogram revealed sinus tachycardia with a right bundle branch block, and venous duplex ultrasonogram of the right lower extremity demonstrated an occlusion of the soleal vein. A computed tomographic angiogram of the chest revealed an acute arterial pulmonary embolism (PE) with intraluminal filling defects within the distal right main pulmonary artery as well as segmental and subsegmental branches of the right lower

and left lower lobes (*Figure 2*). Abdominal ultrasonogram showed a viable fetus with no abnormalities.

Anticoagulation therapy with enoxaparin sodium was started. The patient was discharged from the hospital in stable condition 2 days later with instructions to maintain regular follow-up appointments with the Department of Maternal and Fetal Medicine and to follow up in 1 week in the internal medicine clinic.

Three weeks later (at 18 weeks' gestatiional age), the patient presented to the emergency department, complaints of feeling something protrude through the vagina along with leakage of fluid and decreased fetal movement. On evaluation, the patient was noted to have a segment of the umbilical cord protruding through a partially open cervix. The cerclage was still in place, and fetal heart tones were not detected. At this time, the decision was made to remove the cerclage and to administer misoprosol to induce labor. The patient delivered a nonviable fetus with spontaneous delivery of the placenta. The patient tolerated the procedure without complication and was discharged 2 days later. She was cardiovascularly stable but was advised to continue the prescribed anticoagulation therapy. At the time of hosptial discharge, the patient's shortness of breath and calf pain had resolved.

Discussion

The appropriate management of ISVT remains undefined and becomes more complicated in situations in which there are coexisting medical concerns. Unlike VTEs elsewhere in the body, the literature has not reached a consensus regarding recommendations for the management of ISVT. The 2008 guidelines on antithrombotic and thrombolytic therapy by the American College of Chest Physicians failed to address this entity, further adding to the uncertainty of its management.[9] The goal in managing deep vein thrombosis (DVT) remains the prevention of thrombus propagation, avoidance of embolization, and reduction of venous insufficiency due to intraluminal venous throm-

bosis. Well-validated studies have shown, in the absence of treatment, a trivial rate of propagation of calf DVTs to the popliteal venous segment and no instances of PE.[10,11] Other equally well-validated studies have identified a beneficial effect of anticoagulation therapy in the management of calf DVTs to prevent VTE.[12-14]

Sales et al[15] recommended early ambulation, sequential compression devices on an unaffected extremity, and anti-inflammatory medications if possible. It was not recommended to give anticoagulation medications in the absence of propagation. The authors suggested repeated venous duplex ultrasonographic examinations with careful notation of the proximal extent of the thrombosis within the soleal veins. De Martino et al[16] demonstrated that anticoagulation therapy for DVT in the calf may decrease the incidence of PE and thrombus propagation but cited poor methodology.

The deciding factors in treating the current patient with long-term anticoagulation therapy were the patient's pregnancy (which increased her risk for VTE), her unexplained history of multiple miscarriages, and the greater chance of further immobility. Further, the chosen treatment would not interfere with the cerclage placement and would not put her current pregnancy at risk.

Regarding osteopathic manipulative treatment in the setting of acute DVT, no clearly defined guidelines exist. However, clinical trials are being conducted to study this issue.[17] One osteopathic manipulative treatment technique, the pedal pump of Dalrymple, is contraindicated in the setting of DVT.[18] Of particular interest in the current case was the presence of somatic dysfunction of the thoracic and lumber spines at segments T10-L2, which are most likely indicative of viscerosomatic reflexes from the affected lower extremity.[18] Additional viscerosomatic reflexes identified at the patient's second presentation were the somatic dysfunction at T3-T4 and the anterior Chapman point on the right at the sternocostal junction in the intercostal space between the fourth and fifth ribs. Both of these findings are specific to lower lung problems, most likely due to the acute PE in this patient. Somatic dysfunction resulting from the PE was also found in the exhalation dysfunction of ribs 3 to 10. Although not performed in the current case, an osteopathic approach to management of lower-extremity VTE and PE may provide symptomatic relief by means of normalizing the facilitated segments and altered structures involved. A literature search using MEDLINE, Google Scholar, PubMed, and *The Journal of the American Osteopathic Association* revealed no literature on the structural changes identified on osteopathic structural examination in the setting of PE, DVT, or cerclage placement. Thus, the viscerosomatic reflexes, Champan reflex points, and other somatic dysfunction findings were based on osteopathic principles solely; further studies are required to better categorize these associations in randomized controlled trials.

A notable finding regarding the anatomical distribution of the current patient's ISVT was that the VTE was on the right side, which is unexpected given that more than 90% of VTEs in pregnant patients occur on the left side.[19] It is unclear whether this finding has any clinical relevance, but it does show that different risk factors for unilateral ISVTs and bilateral ISVTs exist,[19] and perhaps further studies may be done to evaluate whether pregnancy is a risk factor for unilateral ISVT.

Conclusion

The management of ISVT is currently not well defined, particularly when it occurs in pregnant patients. It was the decision in the current case to prescribe long-term anticoagulation therapy with enoxaparin sodium given that the patient had a history of multiple miscarriages and was likely to experience further immobility. However, the inability of this patient to get the medication she needed from her pharmacy resulted in acute PE. Future studies examining the risk of ISVT in the setting of pregnancy and evaluating osteopathic manipulative treatment methods for ISVT are required to most effectively manage this clinical problem.

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