



Editorial

A New Horizon of Care: Chronic Venous Occlusive Disease in Children

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Chronic total occlusions (CTOs) of central veins are increasingly common in the pediatric population and pose serious morbidity and mortality risks in those requiring long-term central venous access or multiple cardiac catheterizations. These thromboses are largely secondary to advancements leading to prolonged survival of chronically ill patients and increased use of central venous lines and peripherally inserted central catheters.

Before their use for CTOs, endovascular recanalization techniques have been described in preparation for those requiring access for cardiac surgery and catheterization.¹ Presently, CTOs have been primarily managed medically with anticoagulation; however, Sullivan et al² in their study in this issue of *JSCAI* are reshaping the current management paradigm. This follows a prior case report in April of 2018 describing recanalization of a chronically occluded central vein in a parenteral nutrition-dependent patient with short bowel syndrome who had lost all standard central venous access sites despite current management.³ They had success with recanalization and balloon angioplasty of the right iliofemoral vein and infrarenal inferior vena cava, with prolonged patency at the 10-month follow-up. This technique has wide-reaching implications given the potential impact it can have on pediatric populations requiring long-term central vascular access, especially in patients with short bowel syndrome and intestinal failure as well as all patients with venous occlusions.⁴

In their retrospective cohort study, Sullivan et al² provide significant findings that have broad implications for those requiring chronic venous access. First, their data demonstrate that patients with CTOs can safely undergo recanalization multiple times. The authors performed interventions on 68 venous occlusions during the study, with only 2 containing wire perforations and no significant postintervention complications. Second, they described improvement of congestive symptoms for 8 of 10 patients undergoing recanalization. Historically, those with congestive symptoms were only treated palliatively with anticoagulation, compression, and elevation. Now that more central venous catheters are widely used for diverse indications and CTOs are much more common, this study provides an alternative strategy for

those that have complications from long-term venous access. Third, although there may be increased need for repeated interventions, these procedures were completed safely and, with close follow-up, were still able to provide longer periods of central venous access.

Adoption of this technique will have significant impact on children with short bowel syndrome and other causes for intestinal failure. Burghardt et al⁵ reviewed outcome variables for patients undergoing intestinal transplantation for intestinal failure. These authors found that loss of more than 3 central venous access sites was a statistically significant adverse outcome variable. They also noted an increase in mortality among patients who had lost central access to thromboses because they were parenterally nutrition-dependent. Thus, the loss of access sites continues to be a predictor of primary outcome in those being listed for intestinal transplantation.⁶ The ability to offer alternative management for individuals that lose central venous access secondary to CTOs will decrease morbidity and enhance survival in this population at high risk for experiencing the adverse sequelae of CTO. This important technical advance will reduce the morbidity and mortality of patients at high risk for CTOs who would experience severe consequences from lack of access.

Despite the success of this report in demonstrating that recanalization may be beneficial, this is not without limitations, as the authors themselves recognize. The procedure itself may incur greater risk for venous reocclusion and increase the need for repeat interventions. Furthermore, patients required postprocedural antiplatelet or anticoagulation therapies that have incumbent risks. Although a novel technique and potential change in paradigm, the prior history of the cohort was not protocolized. Selection inclusion and exclusion criteria for intervention were not clearly delineated in the study. The authors did not indicate whether they had exhausted current medical management approaches before intervention. The heterogeneity of the patient population in this study made direct comparison between different groups within the cohort inconclusive. Finally, the report does not include an assessment of patients who underwent unsuccessful venous CTO recanalization. This evaluation would help determine the efficacy

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of the approach. Future work, including comparative studies and protocol designs with recanalization included, may be beneficial in decision making for patients with chronic venous occlusions and clarify a management pathway. Finally, the decision for anticoagulation or dual antiplatelet therapy was reported but not discussed as part of this article. Further studies regarding anticoagulation and its effect on vein patency may be beneficial in delineating postintervention care.

Overall, this study provides strong evidence to support an alternative technique that changes the current practice paradigm. We now have the potential ability to both decrease morbidity from CTOs and, more importantly, preserve critical access sites in chronically ill pediatric patients that would improve mortality with transcatheter recanalization for central venous CTOs. We applaud the diligent work of the authors of this report who have endeavored for nearly 2 decades to develop and refine this important procedure that has immense collateral impact on other disciplines of care for pediatric patients with chronic diseases. The impact of this study and the authors' previous work will potentially have lasting impact on the lives of our patients.

Declaration of competing interest

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