



In-stent restenosis and stent compression in iliofemoral venous stents

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Response to: Yang Y, Zhao Y, Chen Z, *et al.* The effect of stent compression on in-stent restenosis and clinical outcomes in iliac vein compression syndrome. *Quant Imaging Med Surg* 2021;11:2245-52.

Submitted Jul 17, 2021. Accepted for publication Aug 23, 2021.

doi: 10.21037/qims-21-738

View this article at: <https://dx.doi.org/10.21037/qims-21-738>

I read with great interest the manuscript by Yang *et al.* (1) that was published recently and wished to congratulate the authors for their excellent management and diagnosis of in-stent restenosis and stent compression in iliofemoral venous stents.

Some points that may be of interest to our esteemed readers are listed as follows:

- (I) The WallstentTM (Boston Scientific, Marlborough, MA, USA) is one of the most commonly used iliofemoral venous stents. The rate of in-stent restenosis (ISR) and stent compression (SC) with WallstentTM has been found to be high in several clinical series (2). With the recent advent of the newer nitinol stents in the deep venous space, their long-term rates of ISR and SC are currently unknown. The authors (1) have presented their experience with ISR and SC with the laser-cut nitinol stent (Smart Control, Cordis, USA) which is a valuable addition to the current literature on the topic.
- (II) When available, the use of intravascular ultrasound (IVUS) in the detection of stent malfunction is recommended in view of a recent systematic review on the subject (3) as multiplanar venography can underdiagnose lesions. For iliac vein compression, computed tomography venography (CTV) appears to have an excellent correlation with IVUS metrics (4).

However, the use of CTV to determine ISR and SC has not yet been formally validated after performance of iliac venous stenting and this may be one of the drawbacks of the study (1). Did the authors note a correlation between duplex ultrasound and CTV findings in this particular study with regards to SC and ISR?

- (III) Post-stenting, the use of anticoagulation in select patients with post-thrombotic syndrome, poor stent inflow or outflow and thrombophilia conditions is generally advocated (5). However, the role of anticoagulation in patients with iliac vein compression syndrome alone is not well established. The authors stated that patients with thrombophilia conditions were excluded from the study (1). However, it is requested that authors elaborate on the rationale for the use of rivaroxaban in patients who were included in this study. Also, did the authors analyze if anticoagulation had any impact on the rates of ISR or SC? Was an antiplatelet agent added to the regimen for any of the patients? There is at least one study that has reported improved stent patency with anticoagulation and antiplatelet therapy rather than anticoagulation alone (6).
- (IV) SC and ISR can occur together or as independent separate pathologies. It has been noted that ISR

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can occur in stents that are extended below the inguinal ligament (7). Did the authors analyze the relationship of stent extension below the inguinal ligament and ISR/SC?

- (V) The authors (1) noted the rate of stent occlusion was low from ISR/SC (2/50, 4%). This is consistent with prior publications (8). Therefore, ISR and SC do not significantly impact the primary or secondary patency of iliofemoral venous stents. However, due to residual and recurrent symptoms, intervention maybe performed to correct ISR and SC and this will impact the primary-assisted patency of the venous stents.
- (VI) It is important to remember that intervention should consider the patient's symptoms and failure of conservative management rather than being based on a metric that is obtained from an imaging study such as duplex ultrasound or CTV (5).
- (VII) For response of authors (1), please see supplemental material (response to "in-stent restenosis and stent compression in iliofemoral venous stents").

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Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was a standard submission to the journal. The article did not undergo external peer review.

Conflicts of Interest: The author has completed the ICMJE uniform disclosure form (available at <https://dx.doi.org/10.21037/qims-21-738>). The author has no conflicts of interest to declare.

Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Cite this article as: Saleem T. In-stent restenosis and stent compression in iliofemoral venous stents. *Quant Imaging Med Surg* 2022;12(2):1658-1659. doi: 10.21037/qims-21-738

Response to “In-stent restenosis and stent compression in iliofemoral venous stents”

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Keywords: stent compression, in-stent restenosis, iliac vein compression syndrome, intravascular ultrasound, duplex ultrasound, CTV

To the Editor,

We are very grateful for Dr. Taimur Saleem’ recognition and comments on our recent research. Generally, we agree with these comments and respond as follows.

IVUS has many advantages in the diagnosis of iliac vein compression syndrome (IVCS), and it remains the gold standard for diagnosing iliac vein lesions according to current literature (1-3). However, as we mentioned in our study (4), IVUS is not popular in China due to various reasons, while CTV is more commonly used as a method of diagnosis and postoperative evaluation. Indeed, further work is necessary to clarify the accuracy and how to improve the effectiveness of CTV in diagnosing in-stent restenosis (ISR) and stent compression (SC) after iliac vein stenting, since CTV is non-invasive, and more convenient and cheaper than IVUS.

For the correlation between duplex ultrasound (DUS) and CTV findings, we have conducted a study comparing the diagnostic accuracy of DUS with contrast-enhanced ultrasound (CEUS) for the detection of iliac vein stent stenosis using CTV as the reference method (5). Results showed that DUS and CTV had moderate agreement ($\kappa=0.516$) for ISR diagnosis, while CEUS and CTV had very good agreement ($\kappa=0.884$). The sensitivity and specificity of DUS and CEUS for diagnosing ISR were 63.1% and 90.8%, 87.8% and 97.3%, respectively.

According to current literature, antithrombotic therapy after iliac vein stenting in patients with non-thrombotic iliac vein compression syndrome (NTIVCS), either alone or in combination use of anticoagulation and antiplatelet therapy, has not been uniformly recommended, mainly due to the lack of high-level evidence such as prospective randomized studies. Our empirical use of rivaroxaban is largely based on the understanding of the venous system that coagulation may be more important in the fibrin-rich thrombi characteristic of the low-flow, low-shear venous circulation (6). As postoperative antithrombotic regimens vary among studies and recommendations throughout the reported literature range from 1 to 3 anticoagulant or antiplatelet agents with variable duration of therapy, further understanding of the roles of platelet activation and the coagulation cascade after stenting in venous system and the time to initiate and duration of use and dosage schedule of antithrombotic agents is needed to better guide adequate postoperative medications.

Since all the cases included in our study were patients with NTIVCS and no trans-inguinal ligament stent was involved, the correlation of stent extension below the inguinal ligament and ISR/SC was not covered in this study (4).

Although ISR and SC are both common after iliac vein stenting, stent occlusion is always rare. As we mentioned in our study (4) that SSC was associated with ISR’s occurrence rate but the progression of ISR to stent occlusion was not observed, which is consistent with the latest literature (7) that neither of ISR nor SC are relentlessly progressive, clinical intervention should be considered preferentially based on a residual or recurrence of symptoms and not the percentage of ISR or degree of SC.

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