

Avoiding Iliac Vein Stent Migration: Techniques and Appropriate Sizing

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Stent migration after common iliac vein stenting is rare but carries serious complications. There are several reports on cephalad iliac vein stent migration post deployment.¹⁻³ Etiologies are not entirely clear but can be divided into 2 categories based on the time of occurrence:

- a. Iatrogenic, intraprocedural due to advancing balloons or sheaths.
- b. Late dislodgment following deployment, likely due to undersizing of the stent. However, other rare but possible reasons have been reported such as trauma,² thigh massage therapy,³ and thrombus on the stent that leads to flow impairment, prestenotic iliac vein dilation, and subsequent “sailing” of the stent forward.

Avoiding iatrogenic iliac vein stent migration is possible with careful monitoring of sheaths, balloons, and wires as they are advanced across a stented segment under fluoroscopy. The most important step is to avoid pushing against any resistance through the stent. Resistance can be met at the distal edge of the stent while advancing balloons or other catheters, at midstent in an underexpanded segment, or at proximal edge when balloons or wires are being pulled out.

Adequate sizing of the stent is also critical to avoid migration. The best method to size an iliac vein stent is unknown at this time. In our experience, we have sized these stents to the noncompressed ipsilateral common iliac vein (CIV). We typically measure the largest luminal diameter followed by measuring the luminal diameter midway and perpendicular to the largest diameter, and then we average these 2 numbers (**Figure 1B**). The stent is then chosen to be 1 to 2 mm larger than the calculated average.

If the ipsilateral CIV is all compressed, we do the sizing based on the contralateral noncompressed CIV using the same method. Another method we have successfully used is to measure the ipsilateral CIV reference *area* by intravascular ultrasound (IVUS) and determine the matching theoretical diameter of a circle (**Table 1**). The stent is then chosen with 1 to 2 mm larger diameter than the theoretical diameter obtained. Measuring the stent size based on computed tomography angiography (CTA) prior to the procedure to predict the stent to be used is likely to overestimate the size of the stent, as minimal luminal area obtained by CTA seems to be higher than what is measured by IVUS.⁴

The sizing methods above intend to obtain full apposition of the stent to the reference vessel. However, prestenotic dilation could

Table 1. Area of Reference Common Iliac Vein, Corresponding Theoretical Diameter and Matching Choice of Stent Size.

Measured Reference Vessel Area (mm ²)	Theoretical Reference Vessel Diameter (mm)	Selected Stent Diameter (mm)
50.27	8	8-10
78.54	10	10-12
113.1	12	12-14
153.94	14	14-16
201.06	16	16-18
254.47	18	18-20
314.16	20	20-22
380.13	22	22-24

lead to oversizing of the stent. It is unknown at this time whether oversizing can lead to adverse consequences. Reports indicate that pain in the low back may become more exaggerated post oversizing of the stent, but in our experience this tends to resolve in few days to a couple of weeks. However, rare reports in the literature indicate that the pain may become debilitating and chronic, requiring stent removal with surgery.⁵

On the other hand, it is unclear whether stent thrombosis increases with nonapposition of the stent. Also, it is unclear whether stent migration is increased in this situation. We believe that if stents are sized to the contralateral noncompressed iliac vein, and there is significant ipsilateral CIV prestenotic dilation, then stent length may need to extend to the proximal external iliac to avoid stent migration. Finally, it is unknown at this time whether vein wall remodeling would occur and eventually fully “hug” the stented segment. Veins are capacitance vessels, and it is possible that they may return to their original size when the obstruction is removed. At this time, and until more research is available on vein remodeling post stenting, we continue to be conservative in our approach of stent sizing, targeting the reference diameter of the noncompressed

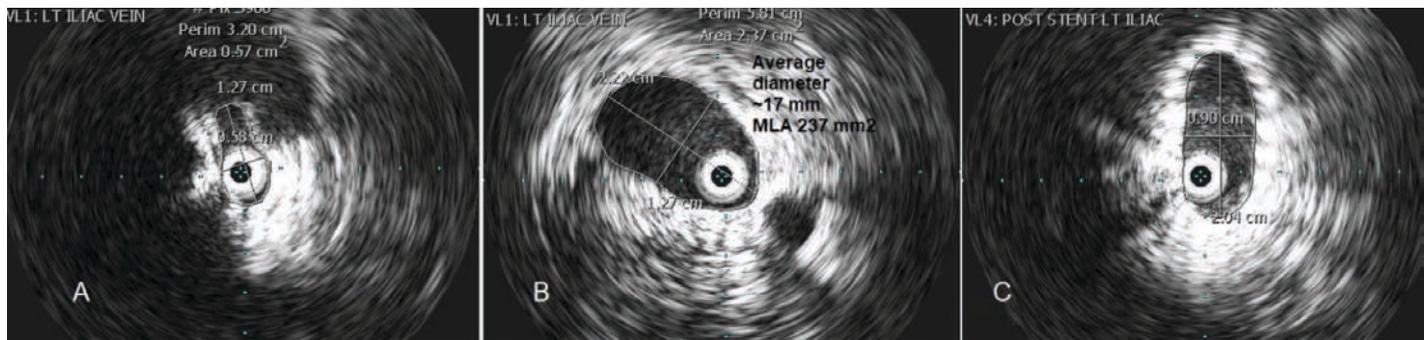


Figure 1. (A) Severe compression at confluence (minimal luminal area of 57 mm². Reference 237 mm². Percent stenosis: 76%). (B) Reference diameter, distal ipsilateral common iliac vein: largest diameter 22.2 mm. Diameter perpendicular at midpoint: 12.7 mm. Average: ~17 mm. Minimal luminal area of reference point 237 mm². Stent chosen was 18 x 80 mm self-expanding stent. (C) Post stent: excellent stent apposition and excellent minimal luminal area gain at confluence.

ipsilateral vein to achieve full stent apposition (Figure 1C).

Predilation of the confluence is critical and is best performed with a higher pressure at 8 to 12 atmospheres with a 1:1 balloon sized to the contralateral common iliac vein. Adequate analgesia is needed. Postdilation is best performed with same size balloon at a pressure yielding full balloon and stent expansion. The braided, self-expanding stainless-steel Wallstent (Boston Scientific), is currently being used and is likely to partially recoil at the confluence irrespective of balloon dilation because of weaker radial force. Newer venous dedicated stents (in various testing phases) may have better radial force and may be easier to deploy more accurately at the confluence. It is best to avoid protruding the stent into the inferior vena cava (IVC) if possible, but this is difficult to achieve with the Wallstent. Most operators favor protruding this stent into the IVC to avoid missing the confluence. However, data suggest that this approach may increase contralateral iliac vein thrombosis or pseudo-obstruction.⁶ This may not be an issue with the newer nitinol-based stents that do not seem to shorten with deployment and can potentially be deployed with accuracy at the confluence with minimal protrusion into the IVC. Postdilation is an important step to anchor the stent against the vessel wall and expand the minimal luminal area, and it should be routinely done to avoid stent migration.

In summary, operators may avoid stent migration with meticulous technique and appropriate sizing of stents. There may be unforeseen factors that contribute to stent migration. These are likely to be rare and need to be evaluated on a case-to-case basis. ■

The author has completed and returned the ICMJE Form for Disclosure of Potential Conflicts of Interest. The author reports research and educational grants with Boston Scientific and Bard.

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