

Evaluation of Function and Structure of a Venous Stent

by a Combination of B-Mode scan, FCDS,
Triplex Ultrasound, and 3D Imaging

3D Imaging can show complicated structures in peripheral vessels that otherwise could only be seen by CT. In contrast to CT, these structures can be looked at in real-time, under comfortable conditions, both for the patient and the examiner, giving the option to show and measure flows at the same time.



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Background

A 34-year-old female has been suffering for three years from severe pelvic pain and swelling of the left lower limb, after giving birth (by *vias naturales*).

Further symptoms were hemorrhoids, labial varicose veins on the left side, and pain in the lower spine, mostly coming like cramps.

The following pathologies were diagnosed:

- spontaneously recanalized thrombosis of the Common Iliac Vein (CIV)
- May-Thurner-Syndrome (Iliac Vein Compression Syndrome)
- intraluminal fibrous spur, which is commonly regarded as an result of the pulsatile compression of the venous wall by the overcrossing artery

The patient was treated by:

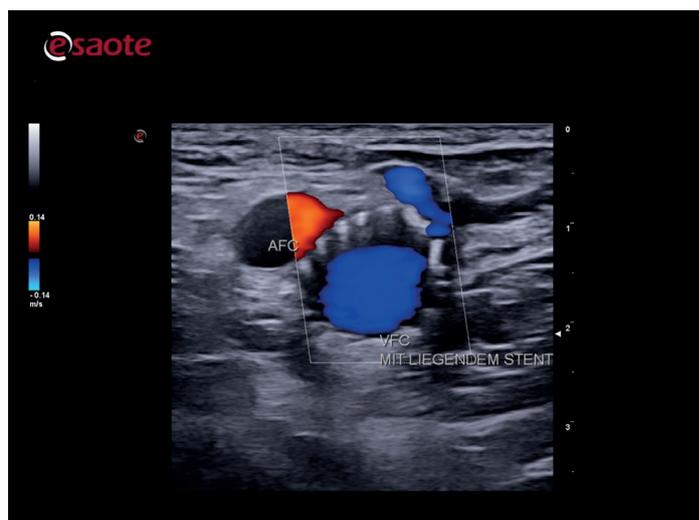
- a transcatheter balloon-dilatation of the compressed part of the CIV
- the placement of two slightly overlying venous stents (beginning two centimeters proximal to the compressing iliac artery down to the distal third of the External Iliac Vein (EIV))

The swelling of the left lower limb improved after the procedure, the labial varicose veins have disappeared, however, the hemorrhoids were unchanged.

Yet, one year after the procedure, the patient sought help due to pain in the groin, especially when sitting or kneeling on the floor with her child.

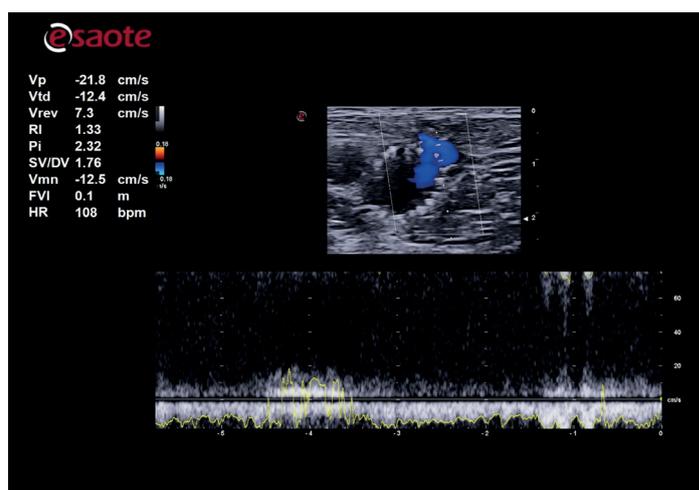
Sonography

The first B-Mode-scan of the left groin showed the stent with its distal end in the Common Femoral Vein (CFV), see picture 1.



Picture 1: the stent can easily be seen in the CFV. The two vessels directly above the CFV, forming the SFJ (Sapheno-femoral Junction), with an orthograde flow into the CFV, seemingly not blocking the SFJ.

To prove this furthermore, a triplex ultrasound was used to show the flow in the SFJ (see picture 2).



Picture 2: strong orthograde flow of the SFJ.

Since the end of the stent had been placed distally to the EIV, but reaching into the CFV and, regarding the position towards the SFJ, distally to the inguinal ligament, this may be the explanation for the pain occurring in the groin area while kneeling or sitting on the floor.

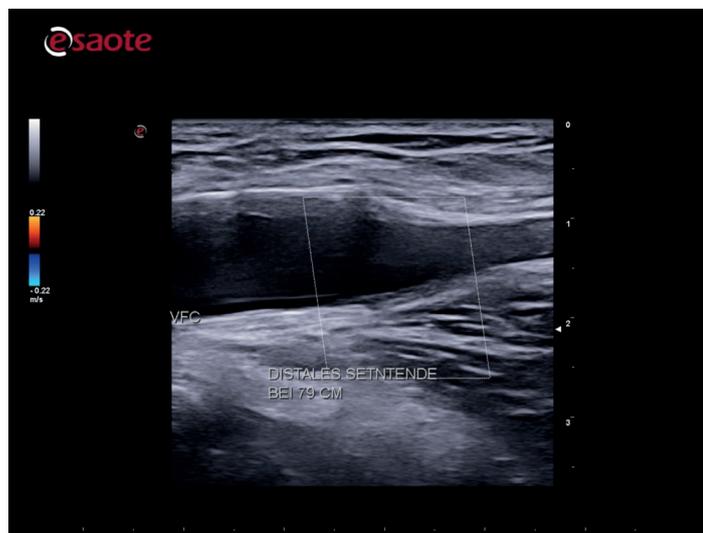
Two questions arose:

- Was the stent is still intact or could it have been broken due to the impact of bending forces, which the device was not designed for?
- was the venous flow altered by a possible structural problem of the device?

The second question was easily answered by a Triplex ultrasound on the CFV, showing a physiological flow-pattern.

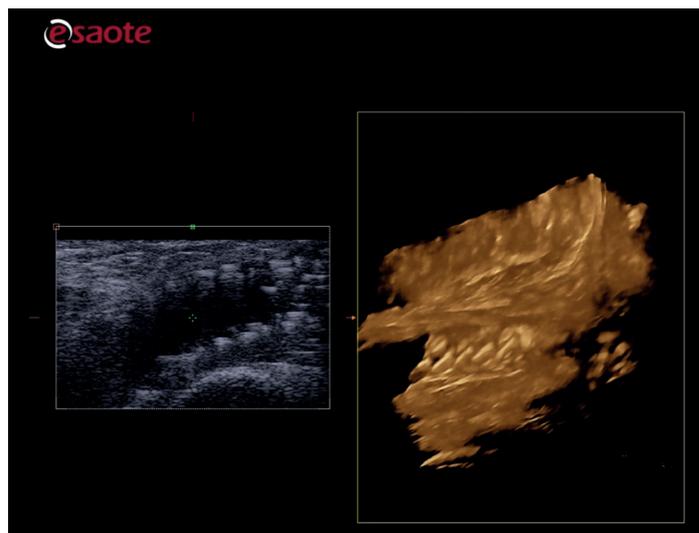
The question regarding a possible stent-fracture could not be solved by these means.

Even though the stent could be well visualized in a longitudinal B-Mode scan, it could not be proven whether some broken parts of the stent were reaching intraluminally, since the CFV can only be scanned using ventro-dorsal imaging and even inclining the probe at oblique angles, was not able to satisfactorily answer this question (see picture 3).



Picture 3: longitudinal B-Mode scan of the stent, positioned far into the CFV. Parts of a possibly broken stent could not easily be detected from either lateral or medial positions.

The question about the integrity of the venous stent was eventually able to be answered by performing a 3D Scan (see picture 4).



Picture 4: stent lying in the CFV, seen here in an oblique, distal proximal view..

The post-processing of the 3D Scan allows us to isolate the structure of interest and to look at it from any desired angle.

Since an evaluation from any oblique, sagittal, or other angle can be achieved by simply turning the object on the screen, it could clearly be shown that the stent did not demonstrate any fractures reaching intraluminally.

Conclusion

3D Imaging, especially by the means of post-processing, can show complicated structures in peripheral vessels that otherwise could only be seen by CT.

In contrast to CT, these structures (even without the post-processing of the scans) can be looked at in real-time (B-Mode, FCDS and Triplex), under comfortable conditions, both for the patient and the examiner, giving the option to show and measure flows at the same time.

The 3D Imaging, moreover, is able to show even delicate details, without use of radiation (CT) or a contrast medium.

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