



## Endovascular therapy of ilio-caval venous obstructions – a ray of hope on the horizon?

Extensive acute thrombosis of the deep vein system is a serious condition with high risk for pulmonary embolism and death. Also in the long-term, the development of a post thrombotic syndrome (PTS) dramatically limits the quality of life in these patients. Therapeutic options comprise oral anticoagulation, thrombolysis, and elastic compression, however clinical effectiveness is moderate. With venous revascularization techniques including Aspirix®, Angiojet®, ultrasound-guided thrombolysis and especially implantation of venous stents, a bunch of new therapeutic approaches are under way. Thus, data in terms of long-term patency rates as well as clinical endpoints are of particular interest. In this edition, we want to focus on venous stenting.

Already in 2005, Hartung et al. [1] presented results on the use of the self-expanding Wallstent in an intention-to-treat setting on n=44 patients (80 % female; median age 42 years) with highly symptomatic (nonmalignant) chronic obstructive venous insufficiency. Technical success rate was shown to be high with 95.5%, and procedure appeared safe (no perioperative death, no pulmonary embolism). However, one early thrombosis (2.4%), as well as one late thrombosis at 15 months and one late death occurred during follow-up (median 27 months). Cumulative primary patency (PP), assisted primary patency (APP), and secondary patency (SP) rates at 36 months were encouraging with 73%, 88%, and 90 % as verified by duplex scanning. In 2009, the same working group underlined these results by presenting long-term results [2] on n=89 patients with high technical success (98%) and patency rates (PP 83%, APP 89%, SP 93% at 3 and 10 years) and also very low complications (no perioperative death, no pulmonary embolism, 2 post-interventional and 3 late DVT, 3 bleeding complications, 1 late death). Clinical symptoms improved in terms of ulcer healing (83% improvement), venous claudication (95%) or pelvic congestion syndrome (88%). Neglén et al. showed similar results on n=870 patients (72% female; median age 54 years) [3]: applying the Wallstent under control of intravascular ultrasound imaging resulted in high patency rates at 72 months (PP 79%, APP 100%, SP 100%), and clinical symptoms improved significantly post intervention (62% pain relief, 32% swelling relief, 58% ulcer healing at 5-year cumulative rate). Severe in-stent restenosis occurred in 5% of limbs at 72 months.

Encouraged by these results, purpose-built venous stents were developed, that stand out by a high flexibility and higher radial force and provide for a greater lengths and vessel diameter compared to arterial stents. Until

now, there are three stent products available dedicated to use in the venous system: the Veniti Vici (VENITI inc., St. Louis, MO, USA), the Zilver Vena (Cook, Bloomington, IN, USA), and the Sinus Venous (OptiMed, Ettlingen, Germany).

O'Sullivan et al. [4] examined the use of the Zilver Vena stent in a retrospective analysis on n=20 patients (60 % female; mean age 59 years) with acute (n=14) or chronic iliofemoral vein obstruction due to pelvic mass (n=9) or a May-Turner Syndrome (n=5). Primary patency was excellent with 100% as evaluated by venous angiography at procedure end. During follow-up, in three patients occurred an early stent thrombosis <30 days but no other complications. Lately, de Wolf et al. [5] presented the first results on the Sinus Venous stent on n=75 patients (65 % female, mean age 45 years) with May-Thurner syndrome or PTS, showing technical success in 100% and cumulative PP of 92% at 12 months. During follow-up, no death, no pulmonary embolism, and low rate of minor bleeding occurred whereas venous claudication improved in 78% of patients. However, despite temporary improvement no ulcer remained healed.

In summary, venous stenting in patients with ilio-caval venous obstruction appears as a promising therapeutic approach with high technical success and patency rates. However, study samples are small and heterogeneous in terms of lesion anatomy, duration of occlusion, and underlying conditions. Randomized controlled trials addressing these issues are missing. Finally, there is a lack of clarity in terms of post interventional anticoagulation varying from the sole use of platelet inhibitors to the use of heparins or oral anticoagulation for several months. Nevertheless, all the signs are that one can be curious about these trends in the therapy of venous obstructions.

## References

1. Hartung et al. *J Vasc Surg* 2005; 42: 1138 – 44.
2. Hartung et al. *Eur J Vasc Endovasc Surg*. 2009; 38: 118 – 24.
3. Neglén et al. *J Vasc Surg* 2007; 46: 979 – 90.
4. O'Sullivan et al. *J Cardiovasc Surg* 2013; 5: 255 – 261.
5. de Wolf et al. *Eur J Vasc Endovasc Surg*. 2015; 50: 518 – 26.

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