Is it possible to identify those patients with post-thrombotic syndrome who will benefit from ilio-femoral stenting?

Antonios Gasparis, MD

Director, Stony Brook Vein Center

Professor of Surgery, Division Vascular Surgery

Who benefit from venous stenting?

Look at literature… not much data

Most studies have mixed group of patients

Benefit from venous stenting may depend on..

- Lesion characteristics
- Concomitant disease
- Clinical presentation

Lesion characteristics

Types of Venous Obstruction

- **Acute thrombotic**
- **Post-thrombotic**
- **Non-thrombotic iliac vein lesion (NIVL)**

Lesion characteristics

Types of Venous Obstruction

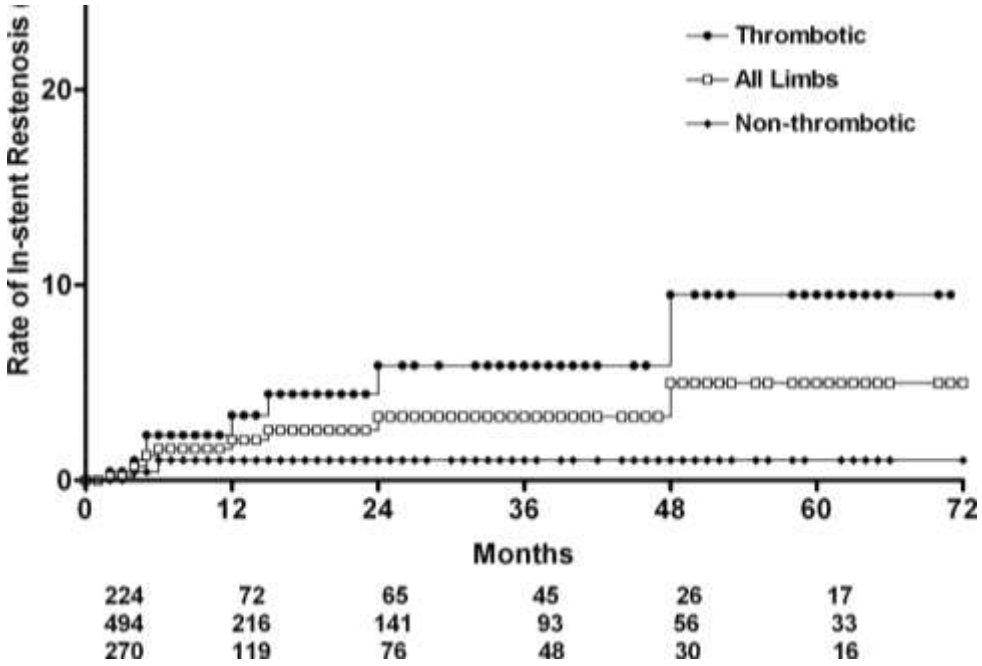
- **Acute thrombotic**
  - –81 patients treated with CDT
  - – During a median follow-up of 91.7 months, primary patency and secondary patency of all patients were 79.3% and 87.3%, respectively.
  - –The presence of MTS was the only significant predictor factor of patency.

Residual stenosis after lysis in acute IF DVT, caused by MTS – is a risk for recurrent DVT and should be treated with stenting to improve the outcome.

Alshabatat AO, Barbati ME, Alzoubi O, Jalaie H, Wittens CHA. The Role of May-Thurner Syndrome in Recurrent Thrombosis after Catheter-Directed Thrombolysis of Deep Vein Thrombosis. Ann Vasc Surg. 2018 Aug 6

Lesion characteristics

Types of Venous Obstruction



- **Post-thrombotic**
- **Non-thrombotic iliac vein lesion (NIVL)**

Raju S et al. J Vasc Surg 2013;1:165-172.

Post-thrombotic lesion characteristics
Degree/location of obstruction

- Obstruction vs. Occlusion
- Location of lesion
- Short lesion vs. long lesion

Gagne PJ, Gagne N, Kucher T, Thompson M, Bentley D. Long-term clinical outcomes and technical factors with the Wallstent for treatment of chronic iliofemoral venous obstruction. J Vasc Surg Venous Lymphat Disord. 2019 Jan;7(1):45-55.

Concomitant disease

- Superficial vein disease
- Infra-inguinal deep vein disease
- Non-venous disease

Combined superficial disease and iliac obstruction

Neglen P et al. Combined saphenous ablation and iliac stent placement for complex severe chronic venous disease. J Vasc Surg 2006;44:828-33

- 99 limbs in 96 patients had percutaneous iliofemoral venous stenting combined with GSV stripping (33) or EVA (60).
- C4 in 51 limbs, C5 in 8 limbs, and C6 in 40 limbs
- primary–secondary etiology, 58:41
- VAS;QoL;VFI;VFT;swelling

• **Severe pain** (>5 on VAS) **fell from 44% to 3%** after intervention.

• **Gross swelling** (grade 3) **decreased from 30% to 6%** of limbs.

• **All quality-of-life categories significantly improved after treatment**

•**Ulcers healed in 68% of ulcerated limbs**

Concomitant disease

- Superficial vein disease
- Infra-inguinal deep vein disease
- Non-venous disease

Rollo JC, Farley SM, Jimenez JC, Woo K, Lawrence PF, DeRubertis BG. Contemporary outcomes of elective iliocaval and infrainguinal venous intervention for post-thrombotic chronic venous occlusive disease. J Vasc Surg Venous Lymphat Disord. 2017 Nov;5(6):789-799.

Gagne PJ, Gagne N, Kucher T, Thompson M, Bentley D. Long-term clinical outcomes and technical factors with the Wallstent for treatment of chronic iliofemoral venous obstruction. J Vasc Surg Venous Lymphat Disord. 2019 Jan;7(1):45-55.

Clinical Presentation

- Venous Claudication
- C1, C2
- CVI
  - C3
  - C4-C6

Venous claudication

- After successful I-F stenting, venous outflow and calf muscle pump function had both improved ($P < 0.001$) and the RVF had decreased ($P < 0.001$)
- The CEAP status had also improved ($P < 0.05$) from a median class C3 (range, C3-C6; IQR, C3-C5) before intervention to C2 (range, C2-C6; IQR, C2-C4.5) after intervention.
- **Incapacitating venous claudication** noted in **62.5%** before stenting **was eliminated in all after stenting** ($P < 0.001$).

Delis KT, Bjarnason H, Wennberg PW, Rooke TW, **Gloviczki** P. Successful iliac vein and inferior vena cava stenting ameliorates venous claudication and improves venous outflow, calf muscle pump function, and clinical status in post-thrombotic syndrome. Ann Surg. **2007** Jan;245(1):130-9.

Venous claudication

- 10 patients with venous claudication
- 9 patients with technical success
- At median 32.5 months - 8/9 stents were patent
- **Improved walking distance in all 8 patients** with 5/8 had normal walking distance

Endovascular treatment of chronic iliac vein obstruction in patients with venous claudication. Broholm R1, **Baekgaard** N, Just SR, Jørgensen M. Ugeskr Laeger. **2007** Apr 23;169(17):1564-8.

C2 Disease

- No data on treatment
- No indication – except for a small number of patients

C3 Disease – Most challenging

- Differential diagnosis of swelling is extensive and need to be evaluated prior to venous stenting
- In most practices, this includes a large number of patients
- Improvement of swelling after stenting is 30-60%
- **Consider stenting if:**
    - No other identifiable cause of swelling
    - Keep patient expectations realistic

C4 Disease or higher

- Advanced clinical venous disease
- May have concomitant superficial vein disease
- Likely to benefit the most clinically

VIVO: Prospective Study of the Zilver® VenaTM Venous Stent in the Treatment of Symptomatic Iliofemoral Venous Outflow Obstruction

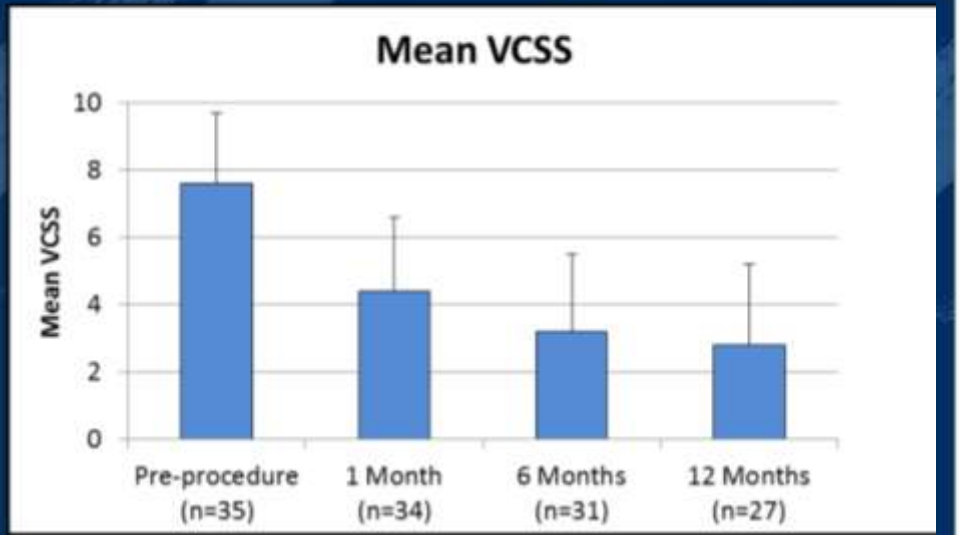
- The VIVO Clinical Study is a prospective, non-randomized, multi-center study intended to evaluate the safety and effectiveness of the Zilver® Vena™ Venous Stent in the treatment of **symptomatic iliofemoral venous outflow obstruction**.

- A total of **243 patients** with **acute or chronic** symptomatic iliofemoral venous outflow obstruction were enrolled in the VIVO Clinical Study, which has a one- year primary endpoint.

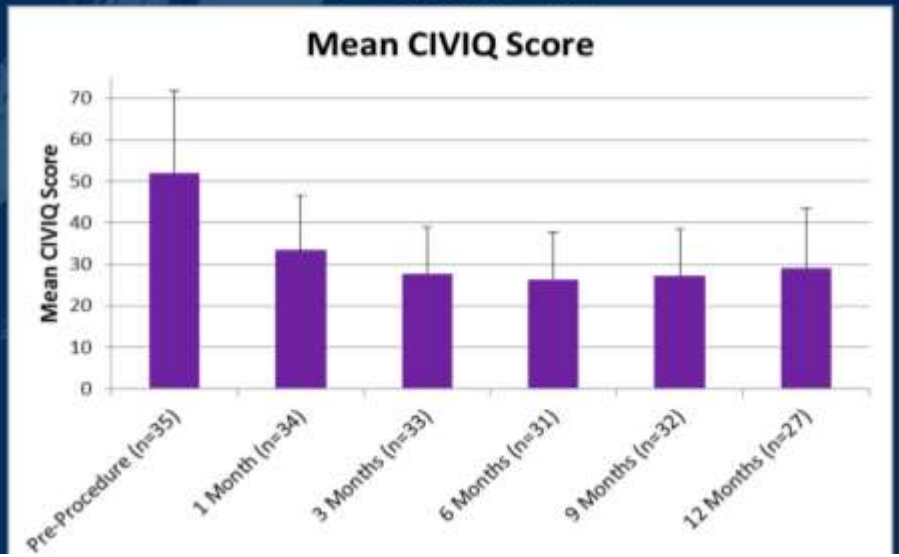
VIVO-EU Results: Prospective European Study of the Zilver® VenaTM Venous Stent in the Treatment of Symptomatic Iliofemoral Venous Outflow Obstruction

- Prospective, non-randomized study in the EU
- **CEAP "C" ≥ 3, or – VCSS pain score ≥ 2**
- Acute DVT – 40%, Acute/Chronic – 10%, Chronic – 50%
- 1 year follow-up

Venous Clinical Severity Score Improved Following Treatment



CIVIQ Scores Improved Following Treatment



VENOVO® VERNACULAR Clinical Trial

Study	**Prospective, Non-Randomized, Multi-Center, Single-Arm Study of the Treatment of Iliofemoral Occlusive Disease – an Assessment for Effectiveness and Safety**
Design	Prospective, multi-center, non-randomized, single-arm **Core lab & DSMB**
Purpose	To assess the safety and effectiveness of the VENOVO® Venous Stent for the treatment of symptomatic iliofemoral venous outflow obstruction
Investigative Sites	21 sites in the US, Europe, and Australia/NZ
Subjects	170 subjects

Inclusion	Exclusion
Unilateral disease of common femoral, common/external iliac	Contralateral disease and lesions that extend into IVC or below lesser trochanter
Symptomatic venous outflow obstruction **≥ 50% by venography**	Uncorrectable bleeding diathesis or active coagulopathy
CEAP "C" ≥3 or VCSS (Pain Score) ≥2	Prior stent placement in the target vessel
Reference vessel diameter 7 mm - 19 mm	Cannot cross occlusion

Primary endpoints*:

- Primary patency (12 months)
- Freedom from MAE (30 days)

Key Secondary endpoints:

- VCSS Pain Score/QoL assessment
- Procedure/technical success
- Freedom from TVR/TLR at 30 days, 6-, 12-, 24-, and 36-months post-index procedure
- Primary patency at 24 and 36 months
- X-ray analysis of stent fracture

*Evaluated against literature derived performance goals of 74%

ITT	PTS (N=93)	NIVL (N=77)	Total (N=170)
Mean Procedure Time, min ± SD	64.7 ± 32.9	48.8 ± 18.0	57.5 ± 28.2
Pre-Dilation, % (n)	87.1 (81)	66.2 (51)	77.6 (132)
Number of Stents Implanted	134	85	219
Number of Stents per Patient	1.4	1.1	1.3
Post-Dilation, % (n)	92.5 (86)	88.3 (68)	90.6 (154)
Final % Diameter Stenosis, mean ± SD	16.2 ± 6.8	11.9 ± 4.9	14.2 ± 6.3
Mean Stented Length, mm ± SD	109.2 ± 49.8	86.0 ± 45.2	100.6 ± 49.1
Acute Technical Success[1], % (n/N)	100 (93/93)	100 (77/77)	100 (170/170)
Acute Procedure Success[2], % (n/N)	97.8 (91/93)	100 (77/77)	98.8 (168/170)

[1] Successful stent deployment to the intended location with adequate lesion coverage (investigator assessment)

[2] Technical success plus no MAEs through discharge. Two patients in the PTS group had a revascularization following a DVT (investigator assessment)

Primary Patency (12-Months)

Primary patency with the VENOVO® Venous Stent was statistically different compared to a literature-derived performance goal (74%)

ITT Population	PTS N=93 (90% CI)	NIVL N=77 (90% CI)	Total N=170 (90% CI)	p-value[3]
Primary Patency (Proportional Analysis)	81.3% (72.6%, 88.1%)	96.9% (90.6%, 99.5%)	88.3%[1] (82.4%, 94.2%)[2]	<0.0001

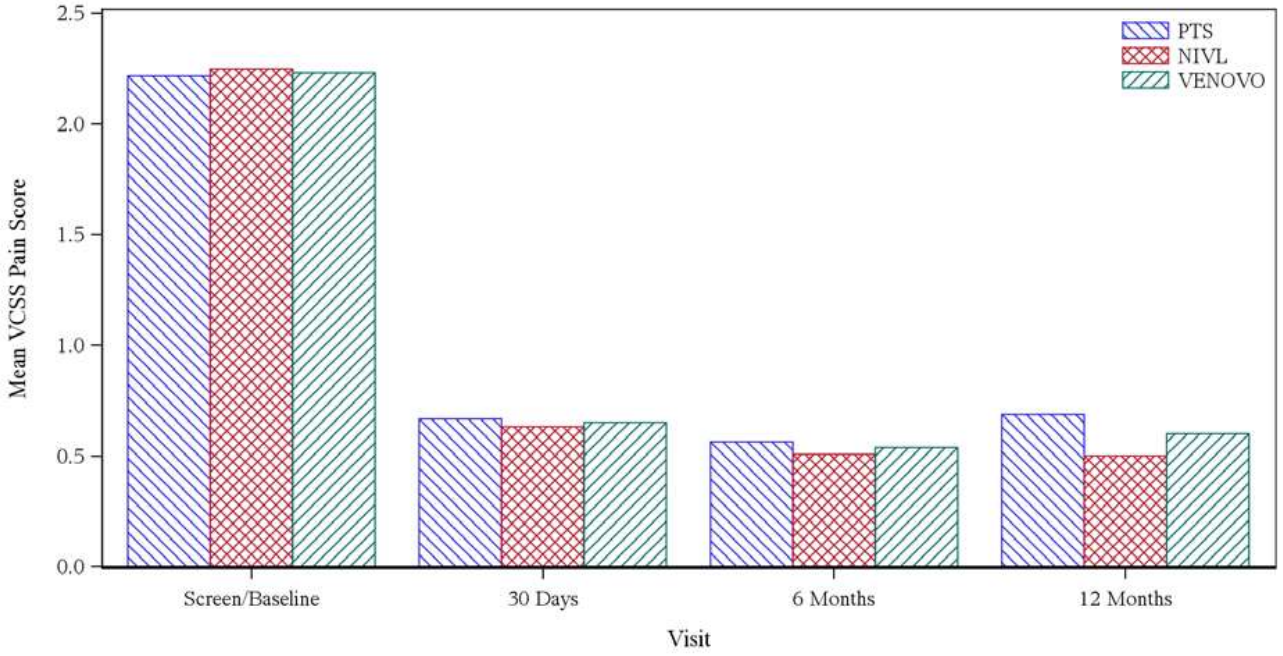
[1] Weighted combined patency rate of PTS and NIVL with 55% and 45% weight, respectively. The combined patency was tested against the performance goal of 74%

[2] 90% confidence intervals from the weighted Z statistics

[3] One-sided p-value calculated from the weighted Z statistics

VCSS Pain Score

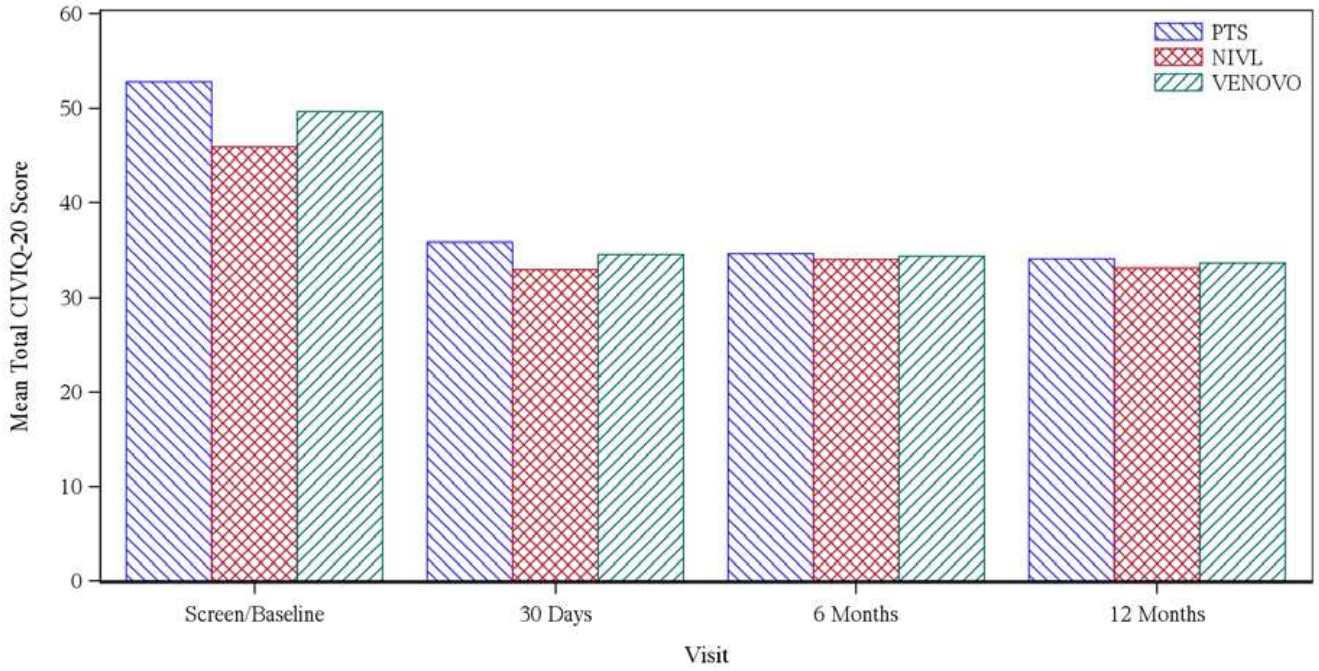
Patients' pain symptoms decreased **from moderate/severe** to **mild/no pain** post-stent placement with a 1.7 point decrease in mean VCSS Pain score



P-value calculated from a two-sided paired t-test

Quality of Life: CIVIQ-20 Score*

Results demonstrated a **significant improvement** on the patient's QoL with a mean decrease in CIVIQ-20 score of 15.7



P-value calculated from a two-sided paired t-test
*Chronic Venous Insufficiency Questionnaire

VENITI VICI VENOUS STENT: VIRTUS Trial

- Prospective, multicenter, single-arm non-randomized, 45 sites OUS and US
- **200 subjects** with clinically significant chronic nonmalignant obstruction of the ileo-femoral venous segment (75% post-**thrombotics** and 25% **non-thrombotics**).
- 1/3 patients had occlusions. 1/3 extended into CFV

VENITI VICI VENOUS STENT: VIRTUS Trial

Results

- At 12 months, primary patency was 84%, exceeding the performance goal of 72.1% ($P < 0.001$).

- **Primary patency was better** in lesions with **non-thrombotic** versus post-thrombotic origins (96.2% vs 79.8%)

- **Venous Clinical Severity Score** declined from **10 at baseline to 5.6 at 12 months**, with only 27.3% of patients having a score of 8 or higher.

Randomized double-blinded study comparing medical treatment versus iliac vein stenting in chronic venous disease

- Clinical class C3 to C6 and a visual analog scale for pain. (VAS pain) score >3

- Randomly assigned 51 limbs with ≥50% on IVUS to undergo medical treatment alone or medical treatment plus iliac vein stenting.

Rossi FH, Kambara AM, Izukawa NM, Rodrigues TO, Rossi CB, Sousa AG, Metzger PB, **Thorpe** PE. Randomized double-blinded study comparing medical treatment versus iliac vein stenting in chronic venous disease. J Vasc Surg Venous Lymphat Disord. **2017** Dec 29.

Randomized double-blinded study comparing medical treatment versus iliac vein stenting in chronic venous disease

- At 6 months, the **VAS pain score** declined
  - from 8 to 2.5 in stent group and
  - from 8 to 7 in medical group (**P < .001**)

- **VCSS** dropped
  - from 18.5 to 11 after stenting and
  - from 15 to 14 with medical treatment (**P < .001**)

- **SF-36 i**mproved from 53.9 to 85.0 with stenting and 48.3 to 59.8 after medical treatment (**P < .001**)

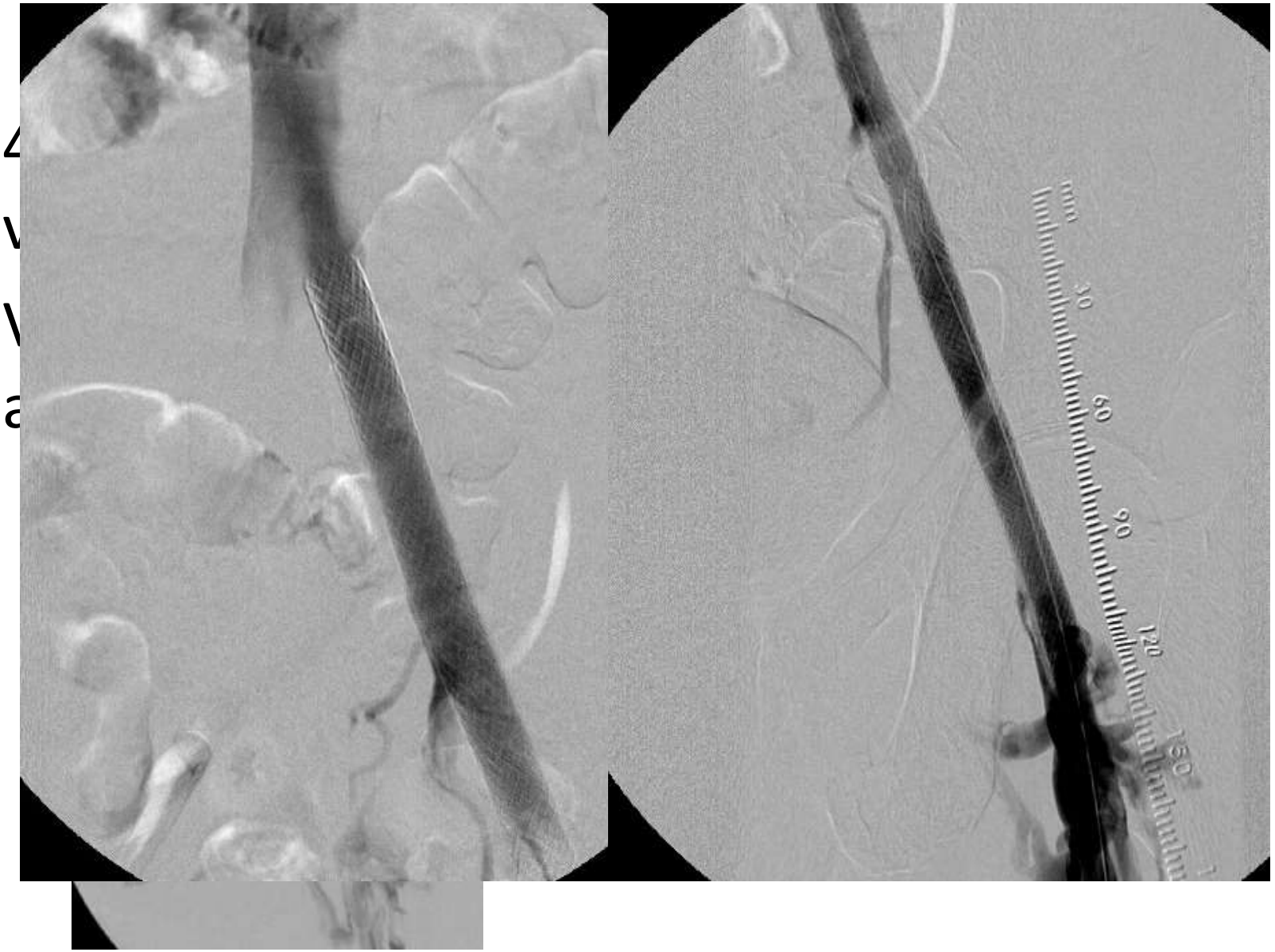
- The ulcer healing rate at 6 months was 90% for iliac vein stenting and 40% for the control group

Rossi FH, Kambara AM, Izukawa NM, Rodrigues TO, Rossi CB, Sousa AG, Metzger PB, Thorpe PE. Randomized double-blinded study comparing medical treatment versus iliac vein stenting in chronic venous disease. J Vasc Surg Venous Lymphat Disord. 2017 Dec 29.

Chronic Venous Thrombosis: Relief with Adjunctive Catheter-Directed Therapy

Goal is to determine if the use of image-guided endovascular therapy (EVT) is an effective strategy to reduce the severity of post-thrombotic syndrome (PTS) and improve quality of life (QOL) in patients with established disabling iliac-obstructive post-thrombotic syndrome (DIO-PTS).

- 4
  w
- V
  a



Summary

Who Benefits from Venous Stenting?

- **Lesion characteristics**
  - Type of obstruction
  - Location of obstruction
  - Degree of obstruction

  Venous Classification – most likely **YES**

  C1, C2 – NO

  C3 – MAYBE in selected patients

  C4-C6 – most likely **YES**
- **Concomitant disease**
- **Clinical presentation**

A powerhouse in venous education

Learn more at: venous-symposium.com