

The LINC logo features a stylized, colorful graphic of a red and orange swoosh above the letters "LINC" in a white, sans-serif font.

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# Classification guided outcomes in chronic venous obstruction

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LINC 2020



# Disclosure

I have the following potential conflicts of interest to report:

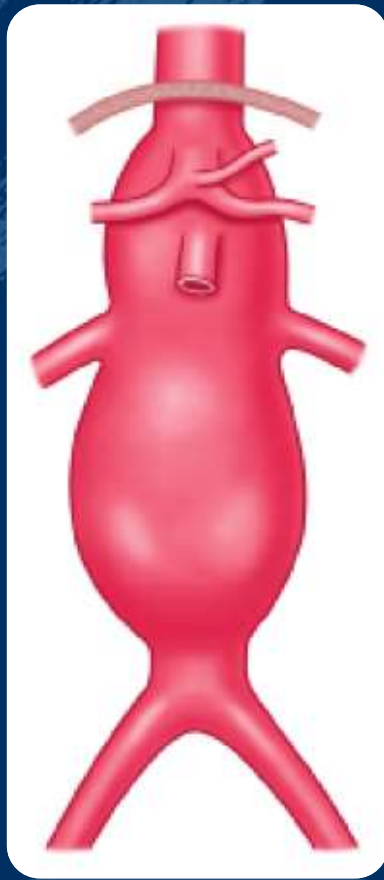
- Receipt of grants/research support

*Medtronic, BD BARD, Cook, Ab medica, Bentley, Optimed, Boston Scientific*

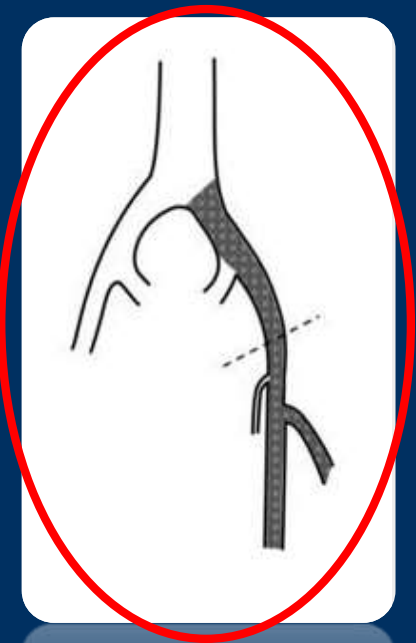
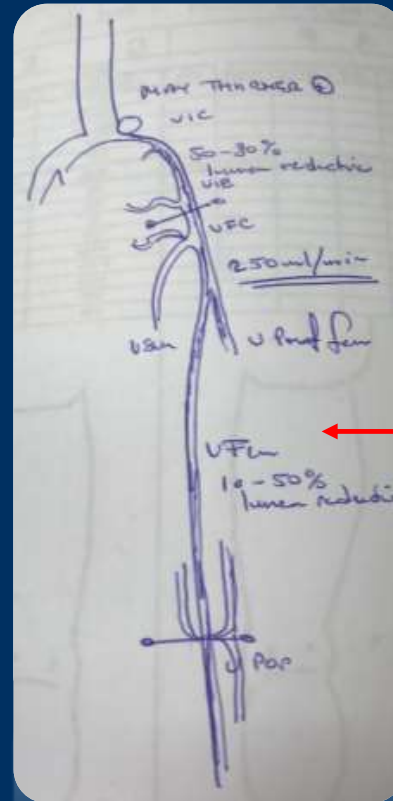
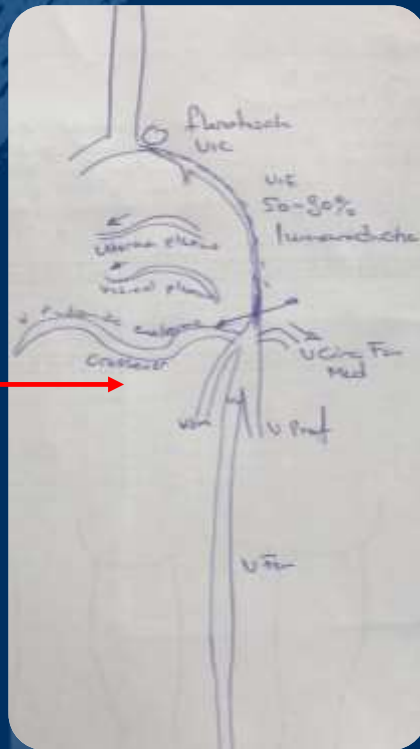
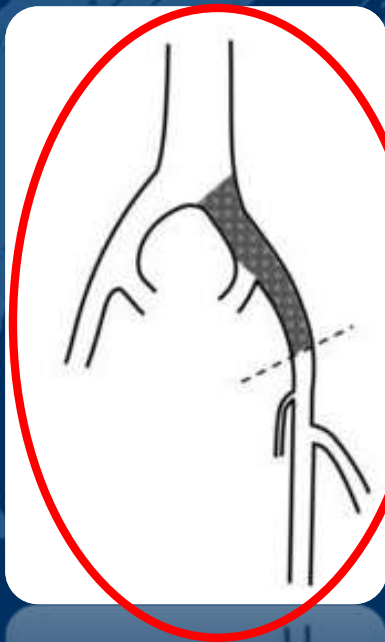
- Receipt of honoraria and travel support

*Medtronic, BD BARD, Cook, Ab medica, Bentley, Optimed, Bonston Scientific*

# Introduction



# Introduction



Do not compare apples with oranges !!!

# Introduction

**Table 4.** Results of Stenting for Chronic Postthrombotic Occlusive Lesions of the Iliac Veins Needing Recanalization

Author	N	Percentage Post-DVT	Technical Success (%)	Intention to Treat	PP (%)	aPP (%)	SP (%)	At
Broholm	10 P	100	90	Yes	NS	NS	80	32 months
Kolbel	62 P	71	92	No	67	75	79	5 years
Raju	167 L	100	83	No	30	55	66	4 years
Hartung	68 P	100	81	Yes	68	72	74	5 years
	80 L			No	84	89	91	

Abbreviations: DVT, deep venous thrombosis; P, patients; L, limbs; PP, primary patency; aPP, assisted primary patency; SP, secondary patency; NS, not specified.

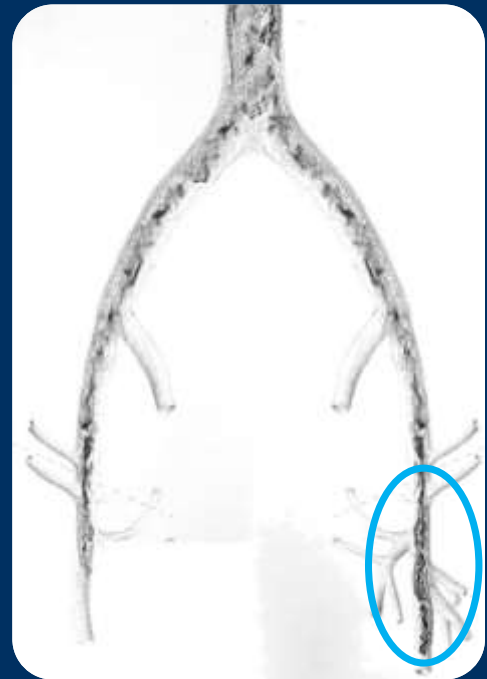
*Perspect Vasc Surg Endovasc Ther.* 2011 Dec;23(4):255-60. doi: 10.1177/1531003512438407. Epub 2012 Mar 6.

**Results of stenting for postthrombotic venous obstructive lesions.**

Hartung O<sup>1</sup>.

# Introduction

- Classification based on anatomical expansion of the postthrombotic trabeculation (> 50 % lumen reduction)





# Classification

- Based on anatomical extension and importance of inflow
- To ensure clinical utility, we propose a simple and practical classification
- Based on the available evidence, the additional involvement of inferior vena cava has a relatively low effect on decision making for intervention and its result, hence a separate category for IVC occlusion has not been included.
- In this classification, a 50% cross-sectional luminal area reduction is considered clinically significant

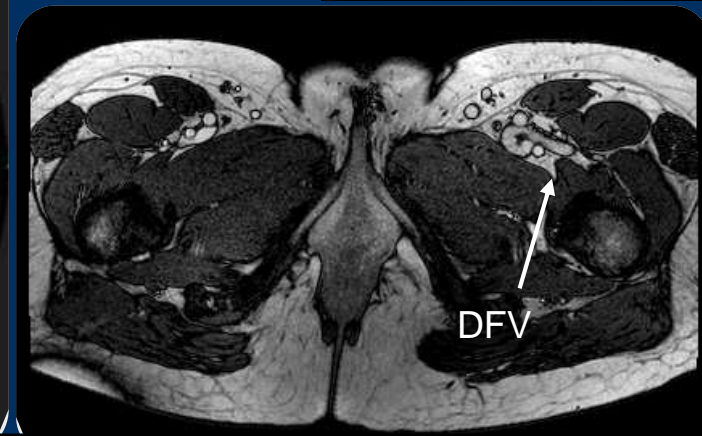
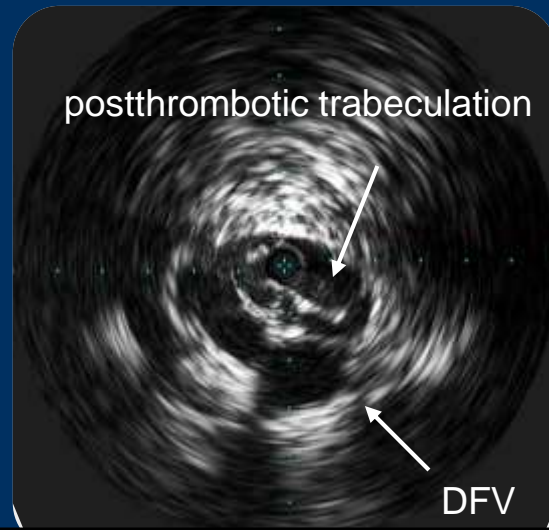
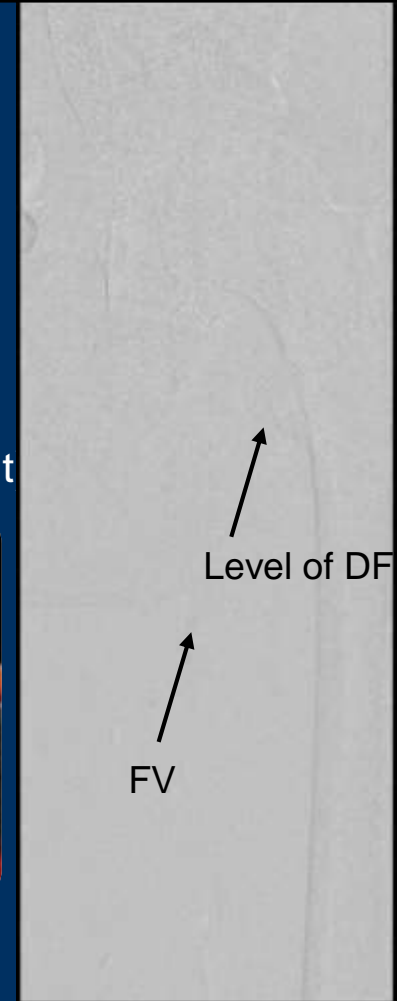
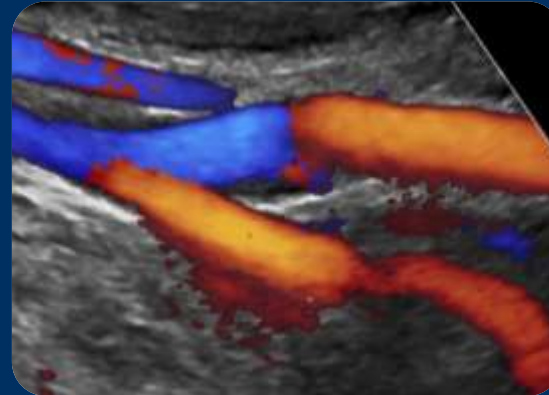
# Introduction

- What to look for?
  - The anatomical extension of the pathology below the inguinal ligament
  - The involvement of the main inflow vessels (FV and DFV (axial transformation))
  - The grade of the lumen reduction in CFV, FV and DFV
    - Non relevant (< 10%)
    - Less relevant (10-50%)
    - Hemodynamically relevant (> 50%)



# Introduction

- Which techniques can be used?
  - Duplex ultrasound
    - Combines anatomical and hemodynamic data (supine and upright)
    - Inexpensive and noninvasive
    - Learning curve
  - CTV / DCTV
    - Supine position
    - Fast
    - Radiation exposure
    - No hemodynamic information
  - MRV / DMRV
    - Supine position
    - High quality
    - Expensive
    - Time consuming
  - Phlebo (intraop)
  - IVUS (intraop)



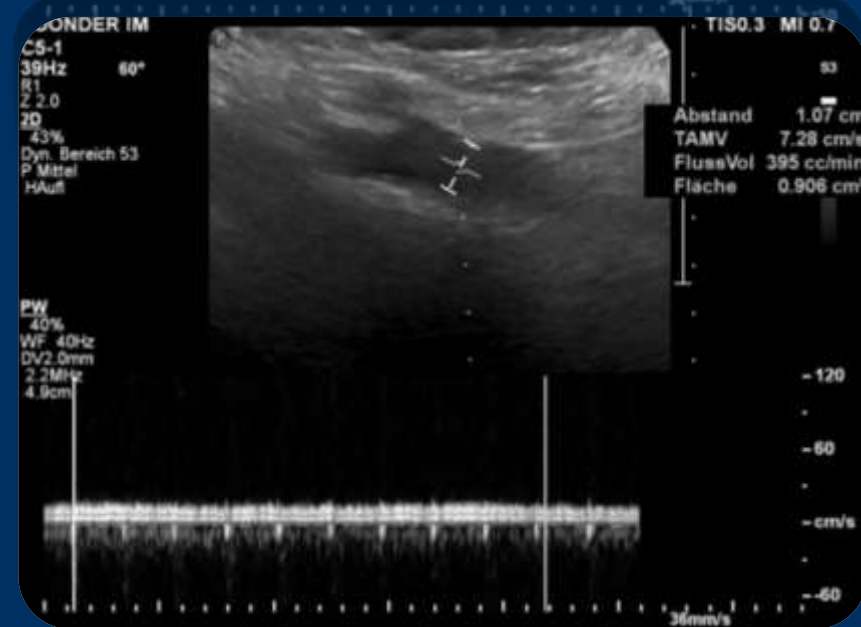
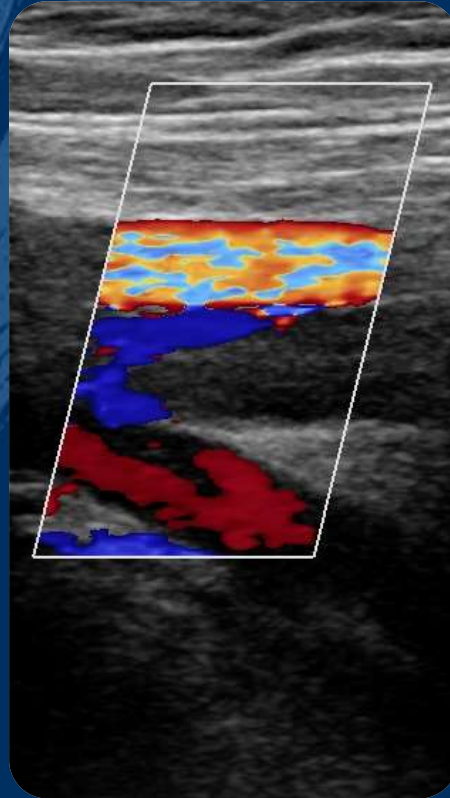
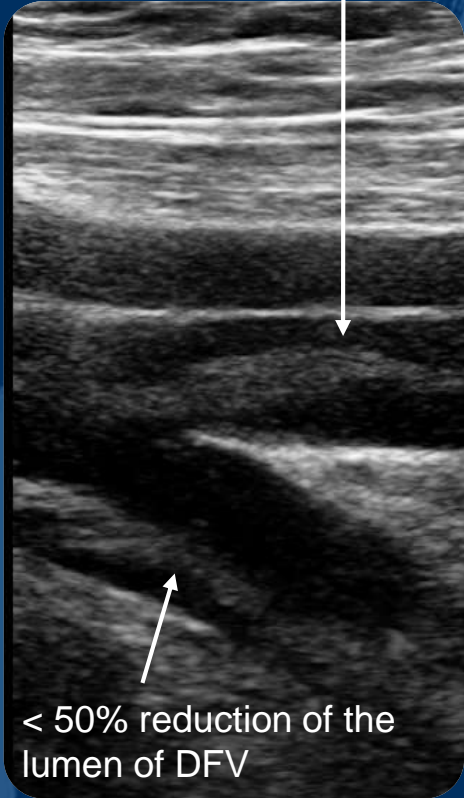
# How we assess it and what we look for

- Duplex Ultrasound
  - Supine and upright position
  - Comparison with the contralateral side
  - Visualizing the postthrombotic trabeculation from knee to infrahep. IVC
  - Measuring the flow volume in CFV above the ostium of DFV
  - Making a precise venous map



Philips EPIQ 7

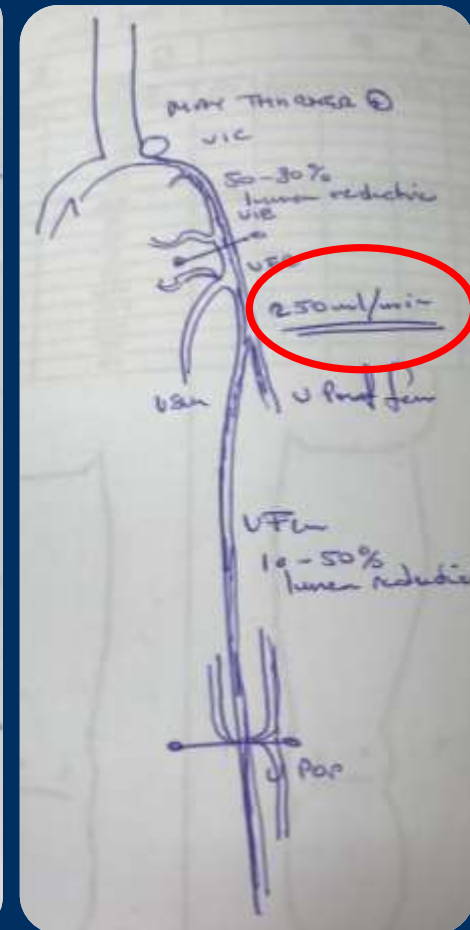
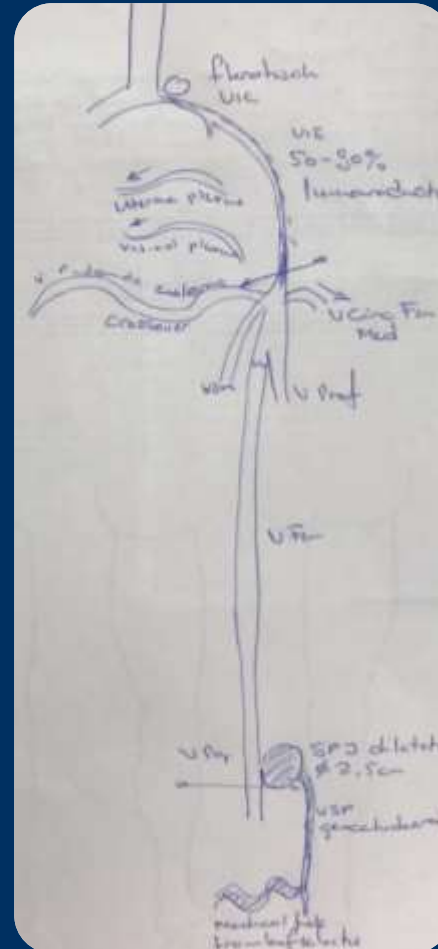
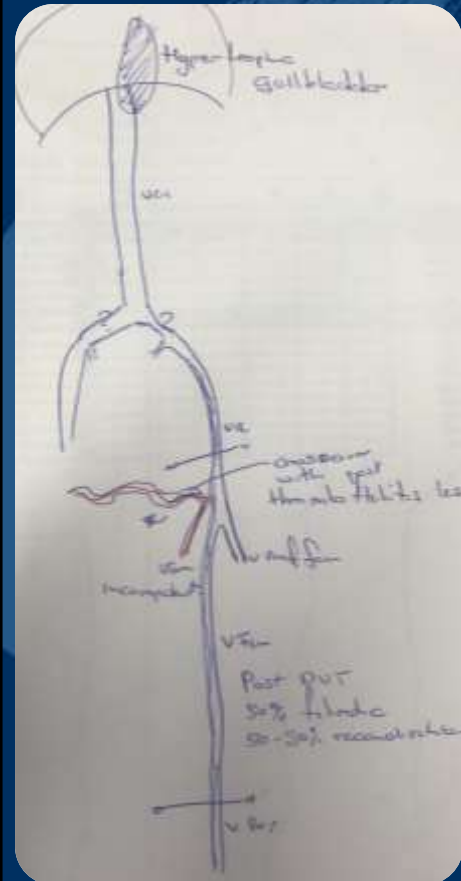
> 50% reduction  
of the lumen of  
FV



Measuring the flow volume cranial of the ostium of DFV

Courtesy Toonder

# Venous mapping





# Validation of the Classification

Mahmood Razavi

Orange, CA  
US

Christian Erbel

Heidelberg  
Germany

Nils Kucher

Zurich  
Switzerland

Gerry O' Sullivan

Galway  
Ireland

Mert Dumantepe

Istanbul  
Turkey

Rick de Graaf

Friedrichshafen  
Germany

Antonio Rosales

Oslo  
Norway

Michael Lichtenberg

Arnsberg  
Germany

Olivier Hartung

Marseille  
France

Suat Dognaci

Ankara  
Turkey

Houman Jalaie

Aachen - Maastricht  
Germany - The Netherlands

Stephen Black

London  
UK

Alun Davies

London  
UK

Manjit Gohel

Cambridge  
UK

Avgerinos Efthimio

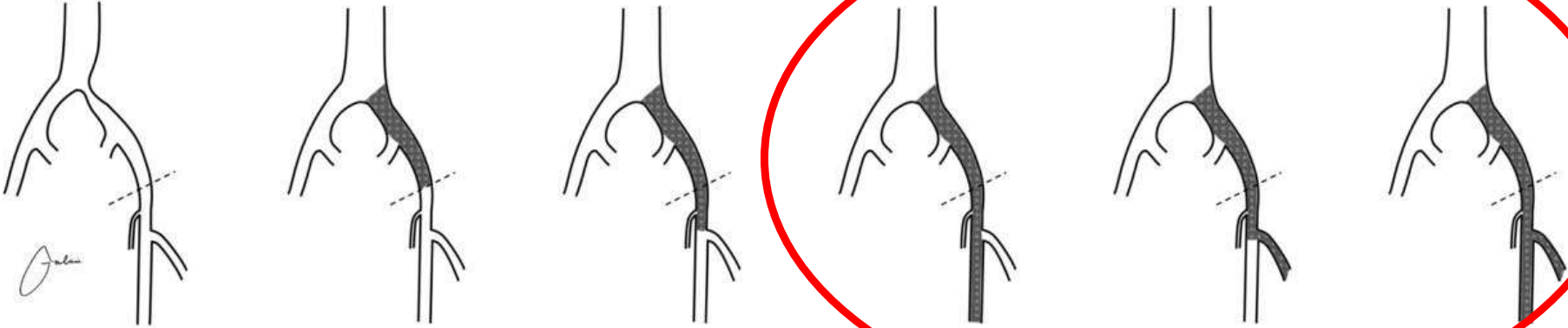
Pittsburgh  
US

# Validation of the Classification

Number of centers = 5  
 Number of patients = 384  
 Follow up (months) = 35 ± 7

Variables	Type of CVO				
	I	II	III	IVa	IVb
Number (n, %)	207 (53.9)	86 (22.3)	53 (13.8)	27 (7)	11 (3)
Age (mean ± SD)	34 ± 8	36 ± 4	41 ± 9	41 ± 11	43 ± 5
Male (n, %)	85 (41.1)	37 (43)	28 (52.8)	21 (77.7)	9 (81.9)
Highest C of CEAP (n, %)					
C1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
C2	73 (35.2)	11 (12.7)	0 (0)	0 (0)	0 (0)
C3	134 (64.7)	49 (56.9)	13 (24,5)	11 (40,7)	3 (27,3)
C4	0 (0)	15 (17.4)	28 (52.8)	11 (40,7)	5 (45.5)
C5	0 (0)	6 (7)	7 (13,2)	2 (7,4)	1 (9,1)
C6	0 (0)	5 (5.8)	5 (9,4)	3 (11,1)	2 (18,2)
PTS assessed by Villalta (n, %)					
None (<5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mild (5-9)	130 (62.8)	21 (24.4)	6 (11.3)	0 (0)	0 (0)
Moderate (10-14)	77 (37.2)	57 (66.3)	37 (69.8)	19 (70.4)	8 (72.7)
Severe (≥)	0 (0)	8 (9.3)	10 (18.9)	8 (29.6)	3 (27.3)
Venous claudication (n, %)	9 (4.3)	35 (40.7)	48 (90.5)	27 (100)	11 (100)
Technical success (n, %)	100	98	95	93	100
Patency rate (%)					
Primary patency	100	94	82	63	67
Assisted primary patency	100	98	93	73	75
Secondary patency	100	100	94	78	77

# Classification of CVO



I                      II                      III                      IV a                      IV b                      V

The gray areas in these illustrations don't necessarily mean a total occlusion but represent a hemodynamically relevant obstruction of more than 50%.

Extensive chronic femoroiliac obstruction



# Clinical impact of this classification

- To aid scientific reporting
  - Comparison of results between studies
  - Comparison of stent outcome
- To ease the decision making for indication and contraindication
- Support therapeutic decisions
  - Endo vs hybrid vs conservative
  - Duration and type of anticoagulation
- To predict outcome easier

Thank you very much

On behalf of all participants

H. Jalaie, M Barbati, G. O'Sullivan, O. Hartung, N Kucher, S. Doganci,  
M Gohel, S Black, E Avgerinos, T Sebastian, M Dumantepe, C Erbel, M Lichtenberg,  
R de Graaf, A Rosales, M Razavi



The logo for LINC (Lifestyle and Innovation in Chronic Venous Disease) features a stylized, colorful graphic of a vein or artery in shades of red, orange, and yellow, set against a blue background with a white swoosh. The letters "LINC" are positioned to the right of this graphic.

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