Venous Stents Placed Below The Inguinal Ligament: Start Worrying, Avoid If Possible

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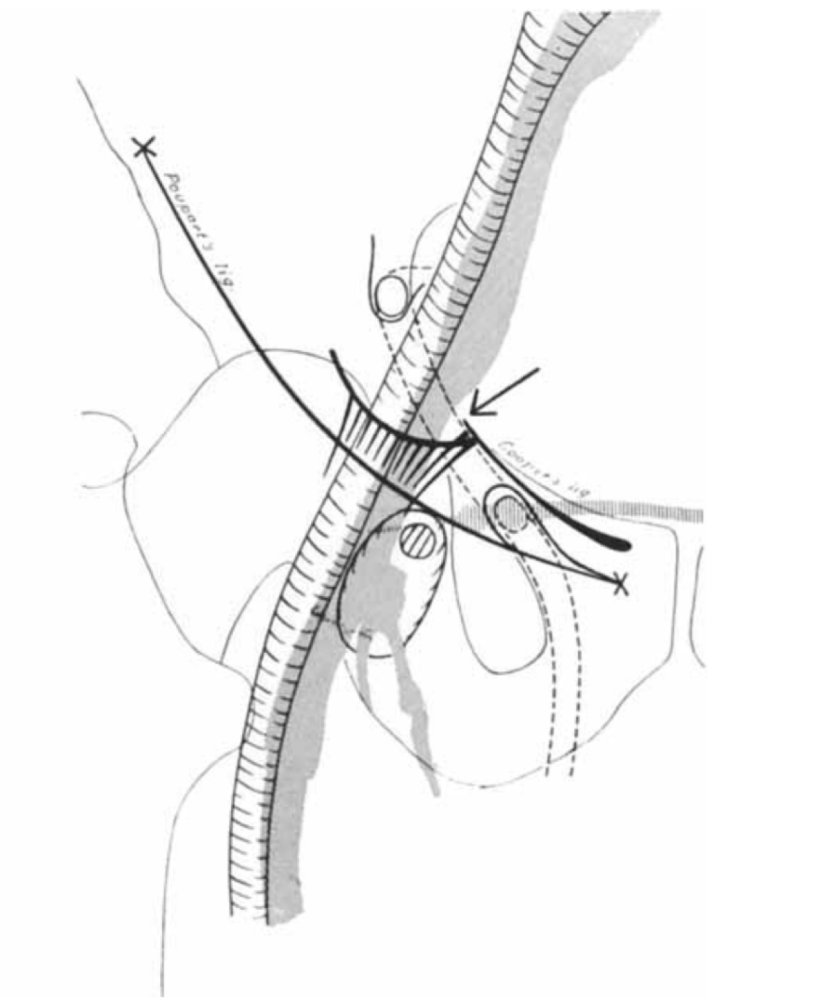
MAYO CLINIC

No Conflict of Interest

The groin



b

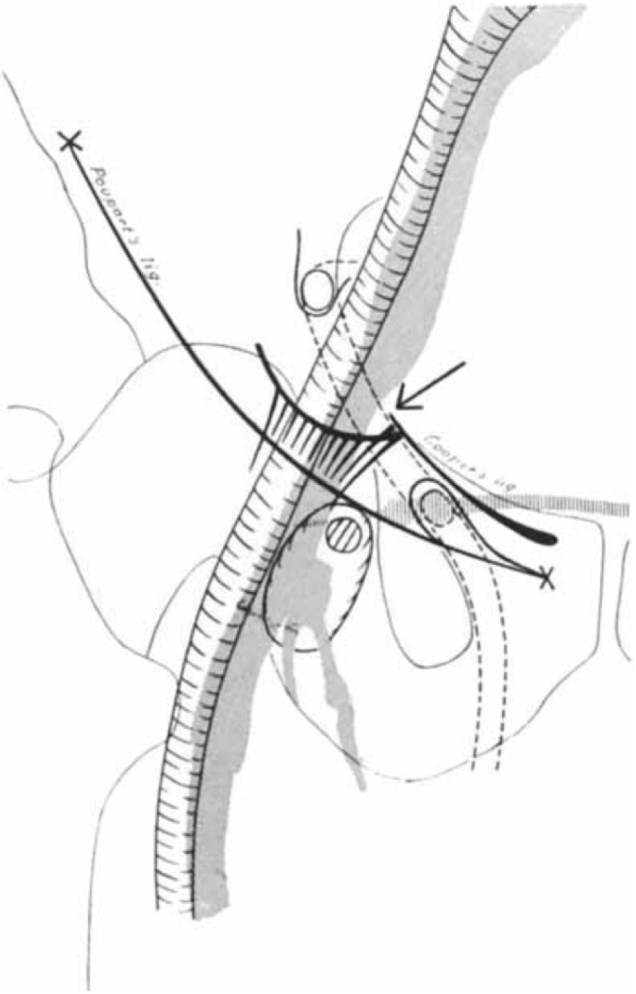
THE STRAIN OBSTRUCTION SYNDROME OF THE FEMORAL VEIN

by

Åke Gullmo

In an earlier paper (1956) on th
leg the author stressed the import
inguinal region in a special way, na
position. The principle of the r
patient is instructed to strain, durir
is injected. Straining in association
the medium into any dilated and i
in the supine position are otherwise

It was soon observed, however,
orders of the leg straining was often
tion of the femoral vein in the lacu
usually typical in appearance (Figs.
the vein was impressed on the med
absence of straining the femoral ve
course, even in those cases where the
ing (Figs. 4, 12, 13).



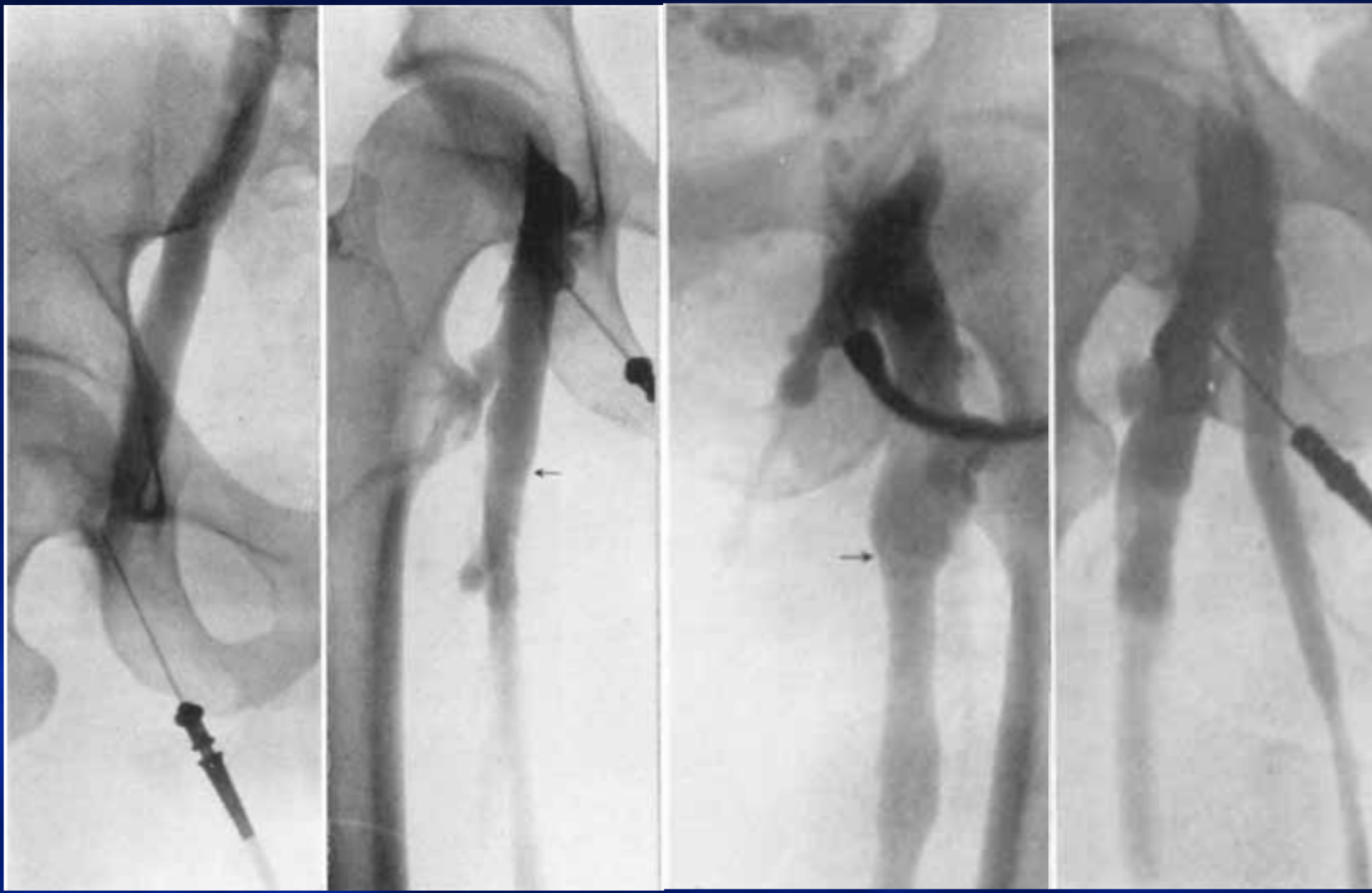
b

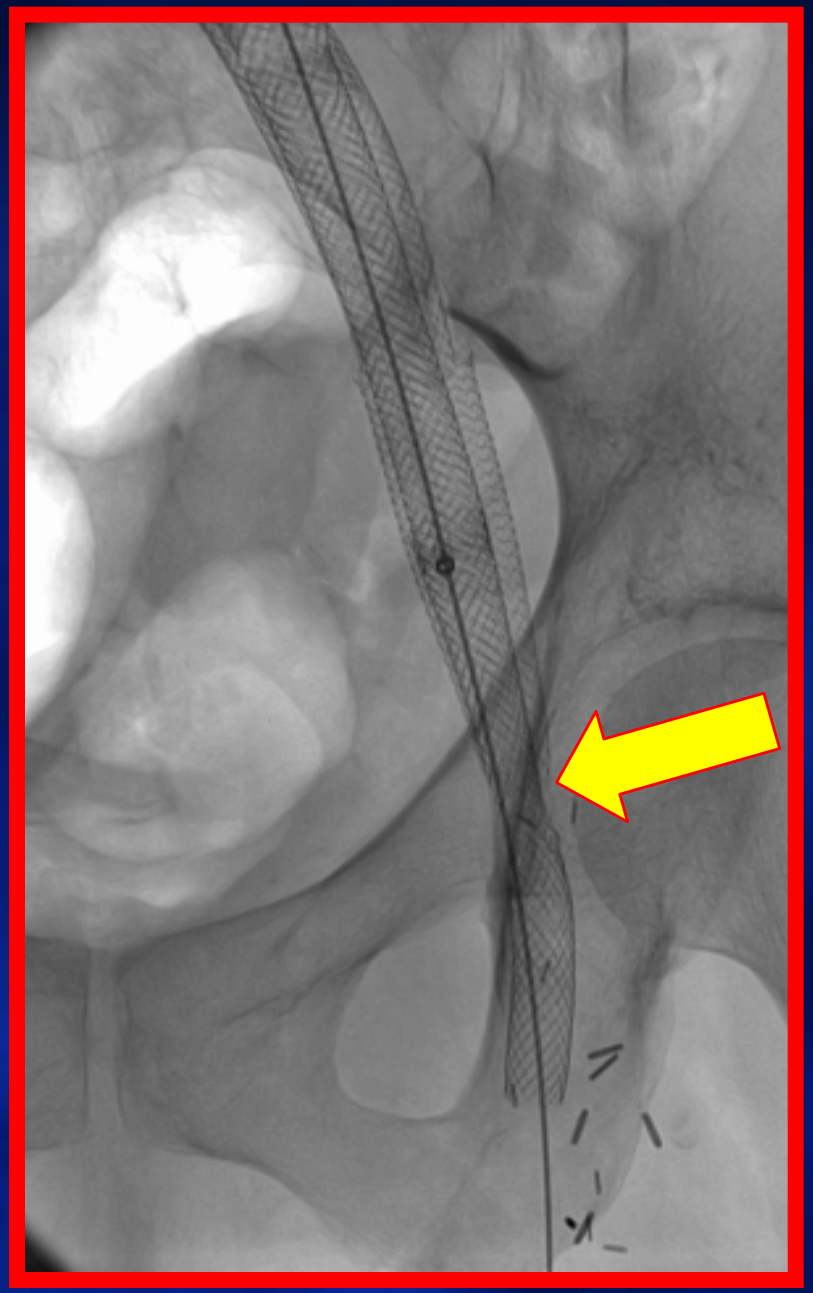
Acta Radiologica,
1957;47:2, 119-137,

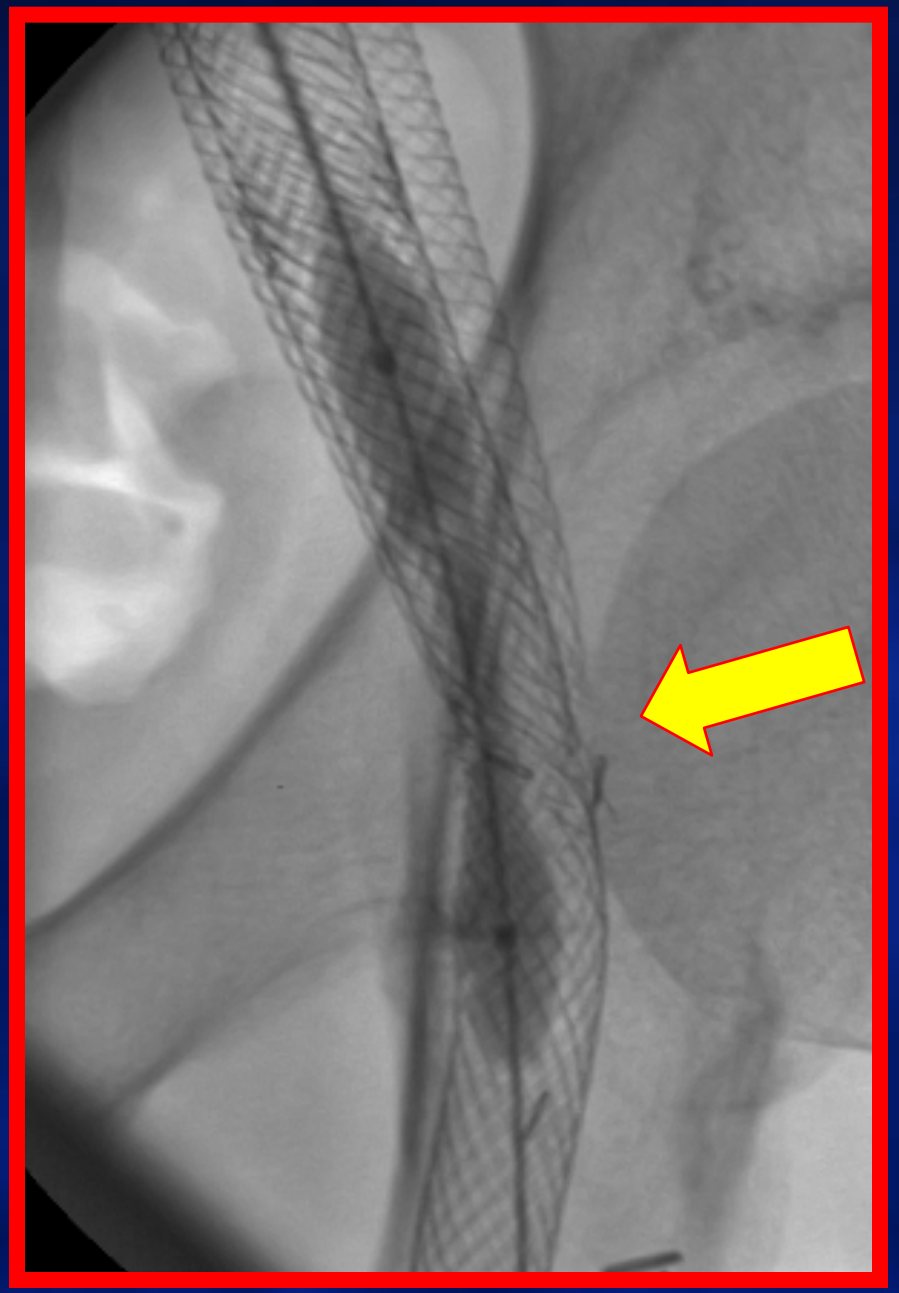
Table I

The number of legs grouped as to changes in the femoral vein in the lacuna vasorum on straining

Obstruction tendency	Primary varicosities		Postthrombotic legs		Total	
Total compression	84		16		100	
Impression and displacement	66		10		76	
Impression	17		5		22	
Valvular occlusion	18	185	7	38	25	223
Displacement only	58		3		61	
Retrograde flow only	28		10		38	
Normal course of vein	31	117	17	30	48	147
Total number of legs		302		68		370



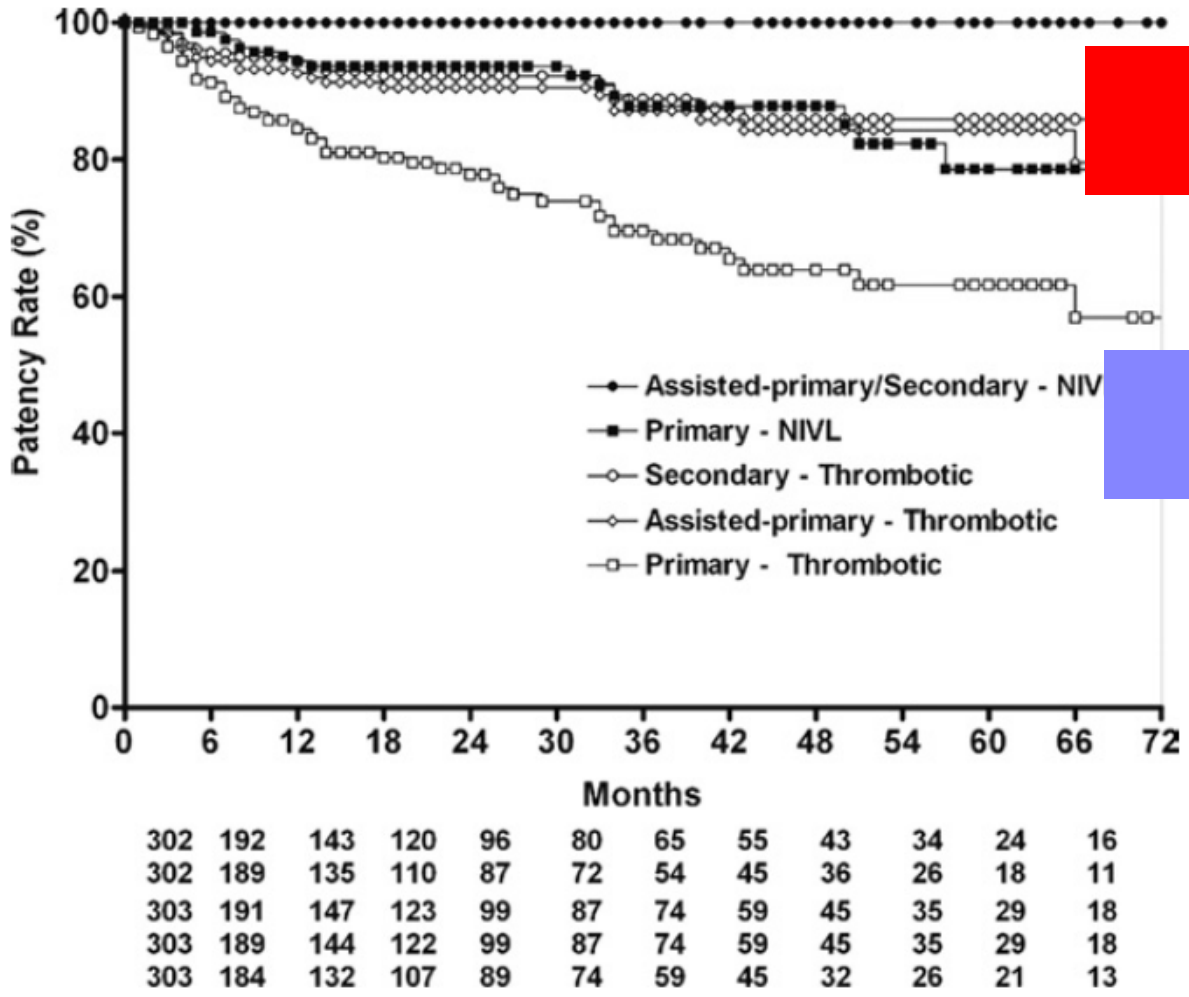




Stenting of the venous outflow in chronic venous disease: Long-term stent-related outcome, clinical, and hemodynamic result

Peter Neglén, MD, Pl
Jackson, Miss

Background: Stenting of
sets are now available to p
intervention.
Materials: From 1997 to
under intravascular ultra
2.6:1, and left/right limb
primary/secondary etiol
recurrent stenosis), clinic
Questionnaire (CIVIQ),
Result: Monitoring for 9
no mortality (<30 days)
days) and during later fo
were 79%, 100%, and 1
Cumulative rate of severe
in nonthrombotic limbs
thrombotic disease; thro
significantly poststent. Se
prestent to 11% and 18%
62% and 32%, respective
categories. Mean hand-f
limbs with no concomit
superficial reflux in subs
Conclusions: Venous sten
rate of in-stent restenosi
consistently reflected in
clinical outcome occurr
obstruction. (J Vasc Su



79 %

57 %

From the American Venous Forum

Venous stenting across the inguinal ligament

Peter Neglén, MD, PhD, T. Paul Tackett Jr, BS, and Seshadri Raju, MD, *Flowood, Miss*

Background: Arterial stenting across joints is not recommended because of increased risk of in-stent focal neointimal hyperplasia and compression or fracture of the stent by joint motion with decreased long-term patency. The aim of this study was to assess the risk of placing stents in the venous system across the inguinal ligament.

Materials and Methods: From 1997 to 2006, 177 limbs with chronic non-malignant obstructive lesions had stents placed in the iliofemoral venous outflow across the inguinal ligament into the common femoral vein. Transfemoral venograms and duplex ultrasound scans to assess cumulative patency rates, cumulative rates, site of in-stent restenosis (ISR), and structural integrity of the stents were performed during follow-up. The results were compared to the findings in 316 limbs with stents terminating cephalad to the inguinal ligament.

Results: Overall cumulative secondary patency (CSP) rate at 54 months was greater in the limbs with cephalad than in those caudad stent termination in relation to the inguinal ligament (95% and 86%, respectively; $P = .0001$). Although CSP of limbs with non-thrombotic obstruction was 100% regardless of the site of stent termination, that of the limbs stented for thrombotic obstruction was greater for stents terminating cephalad than for those caudad to the ligament (90% and 84%, respectively; $P = .0378$). However, a comparison of CSP rates between limbs treated for thrombotic occlusion and those with thrombotic non-occlusive obstruction at 32 months revealed no difference whether or not the stent was placed across the inguinal ligament (occlusion 77% and 77%, $P = .7540$, non-occlusive obstruction 96% and 95%, $P = .7437$). Severe ISR (≥50%) were rare, 5%. The cumulative rate was, however, not significantly different in limbs stented cephalad and caudad to the inguinal ligament (7% and 11%, respectively, $P = .6393$). Focal in-stent recurrent stenosis at the site of the inguinal ligament occurred in only 7% of limbs (all <50%). None of the braided stainless steel stents were compressed or fractured.

Conclusion: Contrary to arterial stenting, braided stainless stents can be safely placed in the venous system across the inguinal crease with no risk of stent fractures, narrowing due to external compression, focal development of severe in-stent restenosis, and no effect on long-term patency. The patency rate is not related to the length of stented area or the placement of the stent across the inguinal ligament, but is dependent upon the etiology and whether the treated postthrombotic obstruction is occlusive or non-occlusive. (J Vasc Surg 2008;48:1255-61.)

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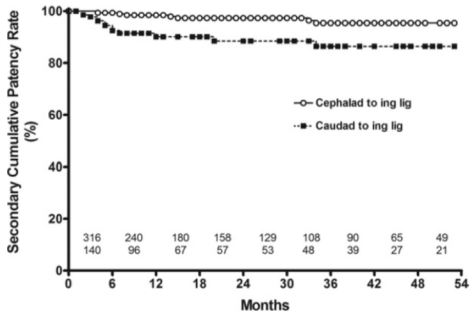

Fig 4. Secondary patency rates in all limbs with iliofemoral stenting terminating cephalad and caudad to the inguinal ligament (ing lig). The lower numbers represent total limbs at risk for each time interval (SEM <10%).

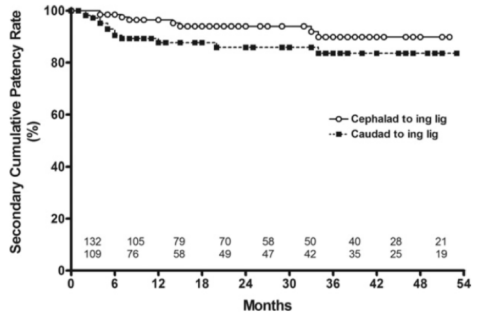

Fig 5. Secondary patency rates in limbs treated for thrombotic obstruction with iliofemoral stenting terminating cephalad and caudad to the inguinal ligament (ing lig). The lower numbers represent total limbs at risk for each time interval (SEM <10%).

Eur J Vasc Endovasc Surg (2009) 38, 118–124

Endovascular Management of Chronic Disabling Ilio-caval Obstructive Lesions: Long-Term Results

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[a] *Department of Vascular Surgery, CHU Nord, Marseille, France*
[b] *Department of Public Health, Faculté de Médecine Timone, Université de la Méditerranée, Marseille, France*
[c] *Department of Haematology and Haemostasis, CHU Nord, Marseille, France*

Submitted 12 September 2008; accepted 5 March 2009
Available online 8 April 2009

KEYWORDS
Ilio-caval;
Obstructive disease;
Stenting

Abstract *Objective:* To report the long-term results of stenting for chr
tive lesions.
Material and methods: From January 1996 to January 2008, 89 patients (72 v
age 43 years) were admitted for endovascular treatment of chronic disabling
tive ilio-caval lesions. Patients were classified as C2 in 15 cases, C3 in 59, C4 in
in six. Median preoperative venous disability score (VDS) and venous clinic
were 2 and 9, respectively. Aetiology was primary in 52 patients, secondary
two. Lesions were bilateral in seven cases, eight patients had inferior vena
and 18 had common femoral vein (CFV) obstructive lesions. Complete occlusi
Results: Technical success was achieved in 98%. The median hospital st
a median follow-up of 38 months (range: 1–144 months), one patient
thromboses occurred. Iterative stenting was performed for restenosis in
sisted-primary and secondary patency rates, in terms of intention to tre
93%, respectively, at 3 and 10 years, with a median VDS of 1. Univaria
significant factors affecting patency were CFV involvement for primar
of deep venous thrombosis (DVT) and CFV involvement for secondary p
The last 46 patients had statistically more severe lesions than the firs
secondary lesions, more occlusions, more stented segments, higher le
and in spite of which patency rates are not different.
Conclusion: Endovenous angioplasty, combined with stenting, is a sur
very minimally invasive technique which provides good long-term pat
it is recognised as the technique of choice for the treatment of ilio-cav
Surgery should be proposed only in case of failure.

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France. Tel.: +33 4 91 96 87 04; fax: +33 4 91 96 83 70.
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doi:10.1016/j.ejvs.2009.03.004

Table 3 Univariate analysis.

Variable	*p* value
For primary patency	
-history of DVT	0.144
-CFV involvement	0.035
-stented CFV	0.06
For secondary patency	
-history of DVT	0.023
-CFV involvement	0.049
-stented CFV	0.325

From the American Venous Forum

Long-term clinical outcomes and technical factors with the Wallstent for treatment of chronic iliofemoral venous obstruction

Paul J. Gagne, MD,[a] Nicole Gagne, BA,[b] Taras Kucher, MD,[a] Michael Thompson, RN,[c] *and* Dana Bentley, BA,[d]
Darien and Norwalk, Conn; and New York, NY

ABSTRACT

Background: Factors affecting long-term clinical outcome and stent patency after iliofemoral venous stenting remain complex and ill-defined. Also, consensus is lacking among clinicians regarding the continuing role for the Wallstent (Boston Scientific, Marlborough, Mass) as dedicated nitinol-based venous stents become available. We undertook this study to review our long-term results using Wallstents and to evaluate the potential role of this stent in the future.

Methods: From 2007 to 2014, there were 77 limbs in 67 consecutive patients that received Wallstents for chronic iliofemoral vein obstruction. Intravascular ultrasound (IVUS) and venography were used to assess lesion type and extent. Baseline clinical severity was assessed with Venous Clinical Severity Score (VCSS) and Clinical, Etiology, Anatomy, and Pathophysiology (CEAP) classification. Clinical improvement was assessed with VCSS at 12, 24, and 36 months. VCSS change ≥4 points was considered significant improvement. Patency was assessed with duplex ultrasound. A retrospective review of patients' records and imaging was conducted to assess baseline and procedural factors associated with long-term clinical outcomes.

Results: Lesions were nonthrombotic in 42 limbs (55%) and left-sided in 48 limbs (62%). Ten patients were treated for bilateral venous disease. Patients were predominantly male (55%); median age was 63 years (range, 47-83 years). Median baseline VCSS was 9 (range, 3-23). IVUS and venography estimated equal vessel compromise length in 37 limbs (48%). IVUS estimated a longer lesion in 32 limbs (42%). Stenting correlated with venography and IVUS in 37 limbs (48%) and more closely aligned with IVUS in 35 limbs (45%). Stents extended into the common femoral vein (CFV) in 17 limbs (22%) and into the inferior vena cava in 6 limbs (8%). Sixty-five (97%) patients had available imaging follow-up (median, 50 months). At 72 months, primary patency in the overall cohort was 87%; assisted primary patency and secondary patency were both 95%. In the nonthrombotic subset, assisted primary patency and secondary patency were 100%; primary patency was 97%. In the post-thrombotic subset, primary patency was 75%; assisted primary patency and secondary patency were 88%. Three early failures occurred. Eight patients required reintervention (range, 0.5-80 months); five interventions were to maintain patency. Cox multivariate regression identified that CFV disease predicted later complications. At last VCSS follow-up per patient (median, 26 months), 52 patients (68%) showed ≥4-point VCSS improvement. None had score worsening.

Conclusions: Venous stenting with Wallstents for iliofemoral post-thrombotic or compressive obstruction proved safe and effective through long-term follow-up, with excellent patency rates. The majority of patients exhibited significant clinical improvement. CFV occlusive disease predicts increased complications. (J Vasc Surg: Venous and Lym Dis 2018;■:1-11.)

Keywords: Venous stent; Wallstent; Iliofemoral veins; Post-thrombotic; Nonthrombotic; IVUS

J Vasc Surg Venous and Lym. 2019, in press

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Table VI. Predictive factors for primary patency and all events

Variables	HR (95% CI)	*P* value
Primary patency		
PT vs NT	6.9 (4.8-9.0)	.07
CFV involvement	4.4 (2.9-5.8)	.04

Outcomes and predictors of failure of iliac vein stenting after catheter-directed thrombolysis for acute iliofemoral thrombosis

Efthymios D. Avgerinos, MD, Zein Saadeddin, MD, Adham N. Abou Ali, MD, Yash Pandya, MD, Eric Hager, MD, Michael Singh, MD, George Al-Khoury, MD, Michel S. Makaroun, MD, *and* Rabih A. Chaer, MD, MSc, *Pittsburgh, Pa*

ABSTRACT

Objective: Iliac vein stenting is recommended to treat venous outflow obstruction after catheter-directed thrombolysis for acute iliofemoral deep venous thrombosis (DVT). Data on the outcome of proximal and distal stent extension are limited. Proximal stent extension to the vena cava may obstruct the contralateral iliac vein, whereas distal extension below the inguinal ligament contradicts common practice for arterial stents. The aim of this retrospective study was to assess outcomes and predictors of failure of iliac vein stents and contralateral iliac vein thrombosis, taking into consideration stent positioning.

Methods: Consecutive patients who underwent thrombolysis and stenting for DVT between May 2007 and September 2017 were identified from a prospectively maintained database. The intraoperative venograms were reviewed for proximal stent placement (covering >50% contralateral iliac vein orifice) and distal placement across the inguinal ligament. End points were ipsilateral DVT recurrence, post-thrombotic syndrome (PTS; Villalta score ≥5), and contralateral DVT. Patients with chronic contralateral DVT or contralateral iliac vein stenting at baseline were excluded from the contralateral DVT outcome evaluation. Survival analysis and Cox regression models were used to determine outcomes.

Results: Of 142 patients lysed, 73 patients (12 bilateral DVTs; mean age, 45.8 ± 17.2 years; 46 female patients) were treated with various combinations of thrombolytic techniques and at least one self-expanding iliac stent (77 stented limbs). Thirty-day recurrence developed in nine (12.3%) patients. The 3-year primary patency and secondary patency rates were 75.2% and 82.2%, respectively. The single predictor for loss of primary patency was incomplete thrombolysis (≤50%; hazard ratio [HR], 7.41; $P = .002$). Overall, 3 of 12 (25%) stents extending below the inguinal ligament occluded at 1 month, 2 months, and 9 months, respectively. The overall rate of PTS (Villalta score ≥5) in the stented cohort was 14.4% at 5 years. This was predicted by incomplete lysis (<50%; HR, 7.09; $P = .040$), stent extension below the inguinal ligament (HR, 6.68; $P = .026$), and male sex (HR, 6.02; $P = .041$). Of the 17 stents that extended into the contralateral common iliac vein and 58 stents that did not, there were 1 (5.9%) and 5 (8.6%) contralateral DVTs ($P = .588$) at an average follow-up of 27.4 ± 33.7 and 22.2 ± 22.3 months ($P = .552$), respectively.

Conclusions: Iliac stenting after thrombolysis for acute DVT guarantees high patency and low PTS rates, provided adequate thrombus resolution has been achieved before stent placement. Stent placement below the inguinal ligament does not affect the patency but may be associated with a higher PTS rate. Stenting proximal to the iliocaval confluence, although a precipitating factor, may not independently increase the likelihood of contralateral DVT. (J Vasc Surg: Venous and Lym Dis 2019;7:153-61.)

Keywords: Iliac vein stenting; Catheter thrombolysis; Deep venous thrombosis; Post-thrombotic syndrome

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Keywords: Iliac vein stenting; Catheter thrombolysis; Deep venous thrombosis; Post-thrombotic syndrome

Review Article

Re-intervention for occluded iliac vein stents

Stacey Black[1], **Amy Janicek**[2], **M. Grace Knuttinen**[3]

[1]University of Arizona, Tucson, Arizona, USA; [2]Arizona State Radiology, Tucson, Arizona, USA; [3]Mayo Clinic, Scottsdale, Arizona, USA

Contributions: (I) Conception and design: All authors; (II) Administrative support: All authors; (III) Provision of study material or patients: All authors; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Stacey Black, MD, USAFR. University of Arizona, Tucson, Arizona, USA. Email: Staceyblack.md@gmail.com.

Abstract: Iliac vein stenting has become more frequent with improved diagnostic capabilities of intravascular ultrasound (IVUS) for recognizing May-Thurner syndrome, chronic venous insufficiency (CVI) and thrombus. In this manus
of the associated pitfalls.
be discussed.

Keywords: Iliac veins; ve

the total length of the stented area and extension of the stent underneath the inguinal ligament are risk factors for stent occlusion and development of in-stent restenosis, the absolute number are low and stent extension should not be abandoned in treatment of recurrent disease.

Cardiovasc Diagn Ther 2017;7(Suppl 3):S258-S266

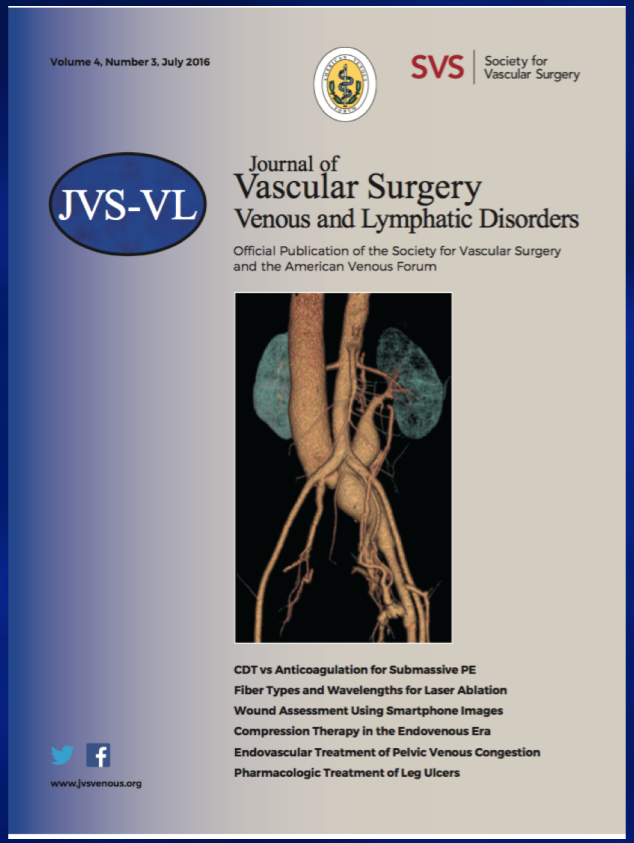
Venous Stents Placed Below The Inguinal Ligament:

Avoid If Possible

It increases in-stent restenosis and need for reinterventions.

If CFV is stented, the patients should be aware of the increased risk of complications

THANK YOU!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