

# 27<sup>ES</sup> JOURNÉES DE LA SOCIÉTÉ FRANÇAISE NEURO-VASCULAIRE

16-18 NOV. 2022  
PALAIS DES CONGRÈS D'ISSY



## TRAITEMENT DE RECANALISATION DANS LES SITUATIONS PARTICULIERES

### Thromboses Veineuses Cérébrales

*Pr Jean-Philippe NEAU, Université de Poitiers*



# Caractéristiques d'une TVC

- Représente **≈ 0,5-1%** des AVC
- Affecte surtout les **sujets jeunes** avec de **nombreuses étiologies**
- **Plusieurs tableaux cliniques**
  - Asymptomatique (découverte fortuite)
  - Céphalées ‘banales’ → Hypertension intracrânienne
  - Déficit (moteur sensitif, langage) ± épilepsie
  - Conscience normale → troubles vigilance → coma
- **TDM/IRM**: TVC isolée ± extensive → IC hémorragique
- Généralement de **bon pronostic... mais pas toujours**
- **Nécessité d'une recanalisation**

# Recanalisation

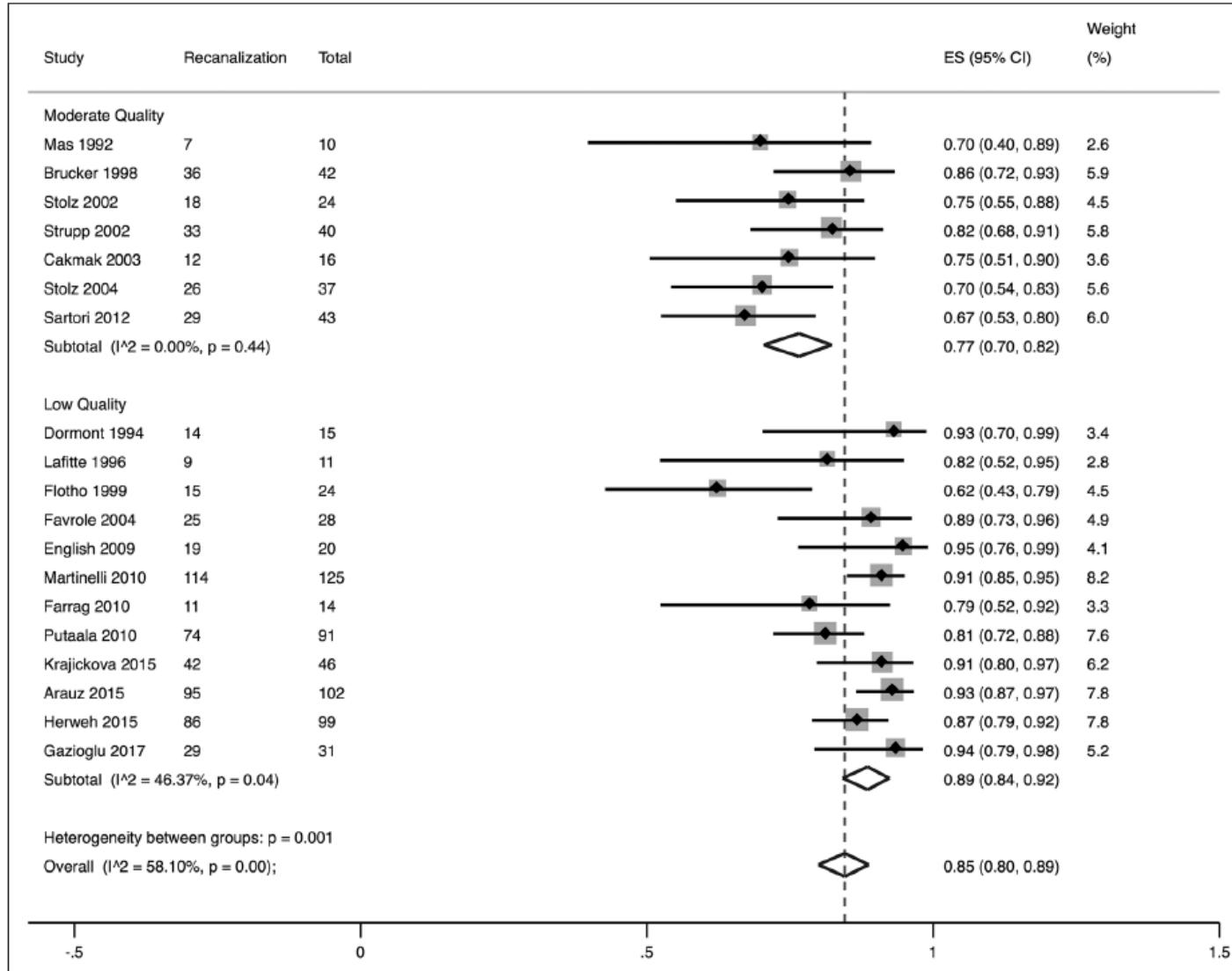
## Recanalization in Cerebral Venous Thrombosis A Systematic Review and Meta-Analysis

Diana Aguiar de Sousa, MD, MSc; Lia Lucas Neto, MD, PhD; Patrícia Canhão, MD, PhD;  
José M. Ferro, MD, PhD



Stroke  
JOURNAL OF THE AMERICAN HEART ASSOCIATION

Stroke. 2018;49:1828-1835.



**A 3 mois: Recanalisation Complète**

**49% (95% CI, 42–55%)**

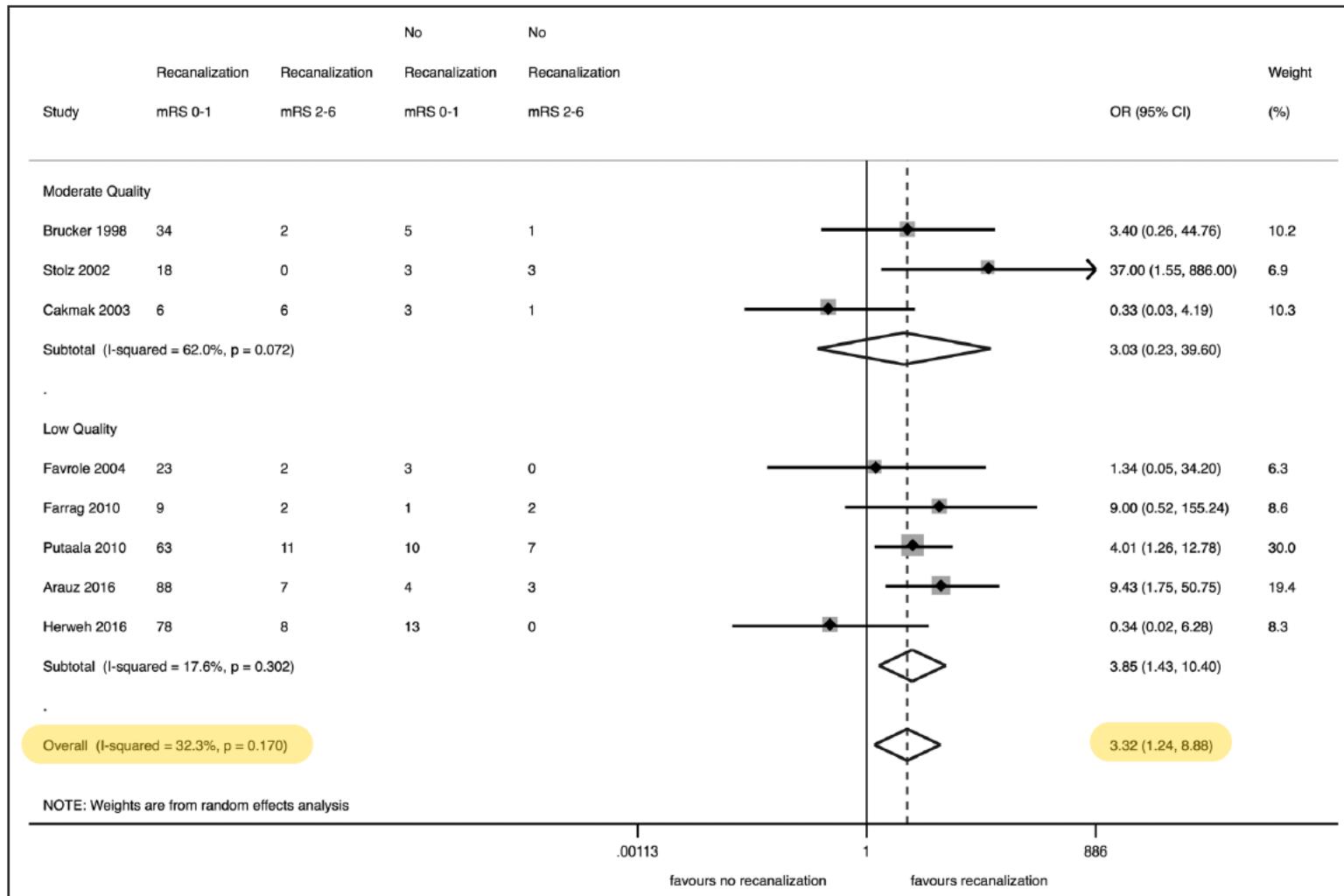
**Conclusions**—The overall rate of recanalization in patients receiving anticoagulation was 85%

# Recanalization in Cerebral Venous Thrombosis

## A Systematic Review and Meta-Analysis

Diana Aguiar de Sousa, MD, MSc; Lia Lucas Neto, MD, PhD; Patrícia Canhão, MD, PhD;  
José M. Ferro, MD, PhD

*Stroke.* 2018;49:1828-1835.



**mRS: 0-1**

Figure 3. Relationship of recanalization status to complete clinical recovery in the last follow-up (random effects model). CI indicates confidence interval; mRS, modified Rankin Scale; and OR, odds ratio.

# The effect of recanalization on long-term neurological outcome after cerebral venous thrombosis

E. REZOAGLI,<sup>\*†</sup> I. MARTINELLI,<sup>‡</sup> D. POLI,<sup>§</sup> U. SCODITTI,<sup>§¶</sup> S. M. PASSAMONTI,<sup>‡</sup>  
P. BUCCIARELLI,<sup>‡</sup> W. AGENO<sup>\*\*</sup> and F. DENTALI<sup>\*\*</sup>

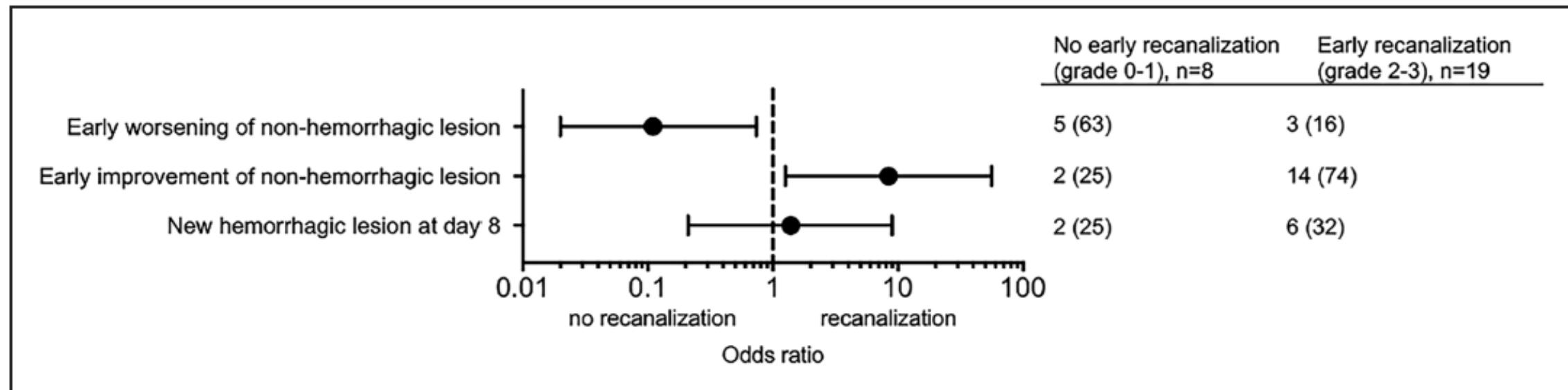
*Journal of Thrombosis and Haemostasis*, 16: 718–724 2018

**Table 5** multivariate (B) analyses of variables associated with good neurologic outcome (mRS = 0–1)

N = 508	OR	P	95% CI
(B) CVT recanalization	2.56	< 0.001	1.59–4.13
Cancer	0.29	0.029	0.09–0.88
Personal history of VTE	0.36	0.033	0.14–0.92
Hormonal therapy	2.30	0.050	1.00–5.29

# Early Recanalization in Patients With Cerebral Venous Thrombosis Treated With Anticoagulation

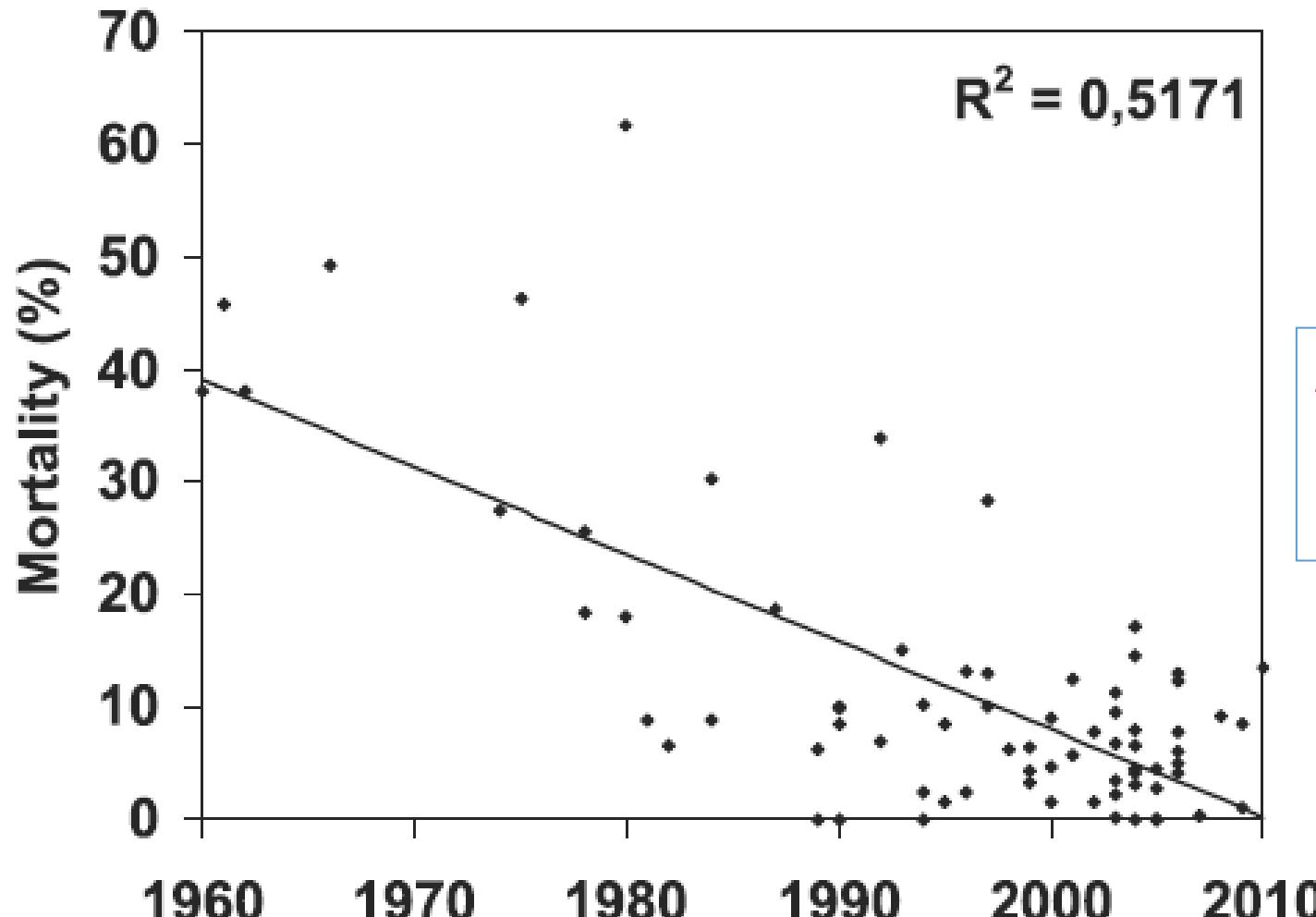
Diana Aguiar de Sousa, MD; Lia Lucas Neto, MD, PhD;  
 Antonio Arauz, MD, PhD; Ana Luísa Sousa, MD; Denis Gabriel, MD; Manuel Correia, MD, PhD;  
 Raquel Gil-Gouveia, MD, PhD; Sara Penas, B.Hlth.Sci; Mariana Carvalho Dias, MD;  
 Manuel A. Correia, MD; Marta Carvalho, MD; Patrícia Canhão, MD, PhD; José M. Ferro, MD, PhD



**Figure 3.** Summary of odds ratios and 95% CIs for the associations between early recanalization (grades 2–3) and the evolution of the parenchymal brain lesions related with cerebral venous thrombosis.

**Absence de recanalisation dans les 8 jours → aggravation du volume lésionnel**

**Conclusions**—Venous recanalization started within the first 8 days of therapeutic anticoagulation in most patients with CVT and was associated with early regression of nonhemorrhagic lesions, including venous infarction. There was an association between persistent venous occlusion at day 8 and enlargement of nonhemorrhagic lesions. (*Stroke*. 2020;51:1174-1181.)



**Amélioration:**

- Détection TVC
- Prise en charge tttt

**Conclusions**—There is a clear trend in declining mortality among patients with CVT over time. Possible explanations are improvements in treatment, a shift in risk factors, and, most importantly, the identification of less severe cases by improved diagnostic methods. (*Stroke*. 2014;45:1338-1341.)

# Buts d'un traitement antithrombotique

1. Eviter l'extension du thrombus → aggravation clinique
  2. Recanaliser le sinus et / ou veine occlus
  3. Prévenir une embolie pulmonaire / TVP
  4. Traiter un éventuel état prothrombotique sous-jacent
- Amélioration du pronostic

# Traitements de Recanalisation

- **Phase aiguë**

- Héparine non fractionnée ou Héparine de bas Poids Moléculaire (HBPM)
- Thrombolyse
- Thrombectomie mécanique ( $\pm$  thrombolyse is)

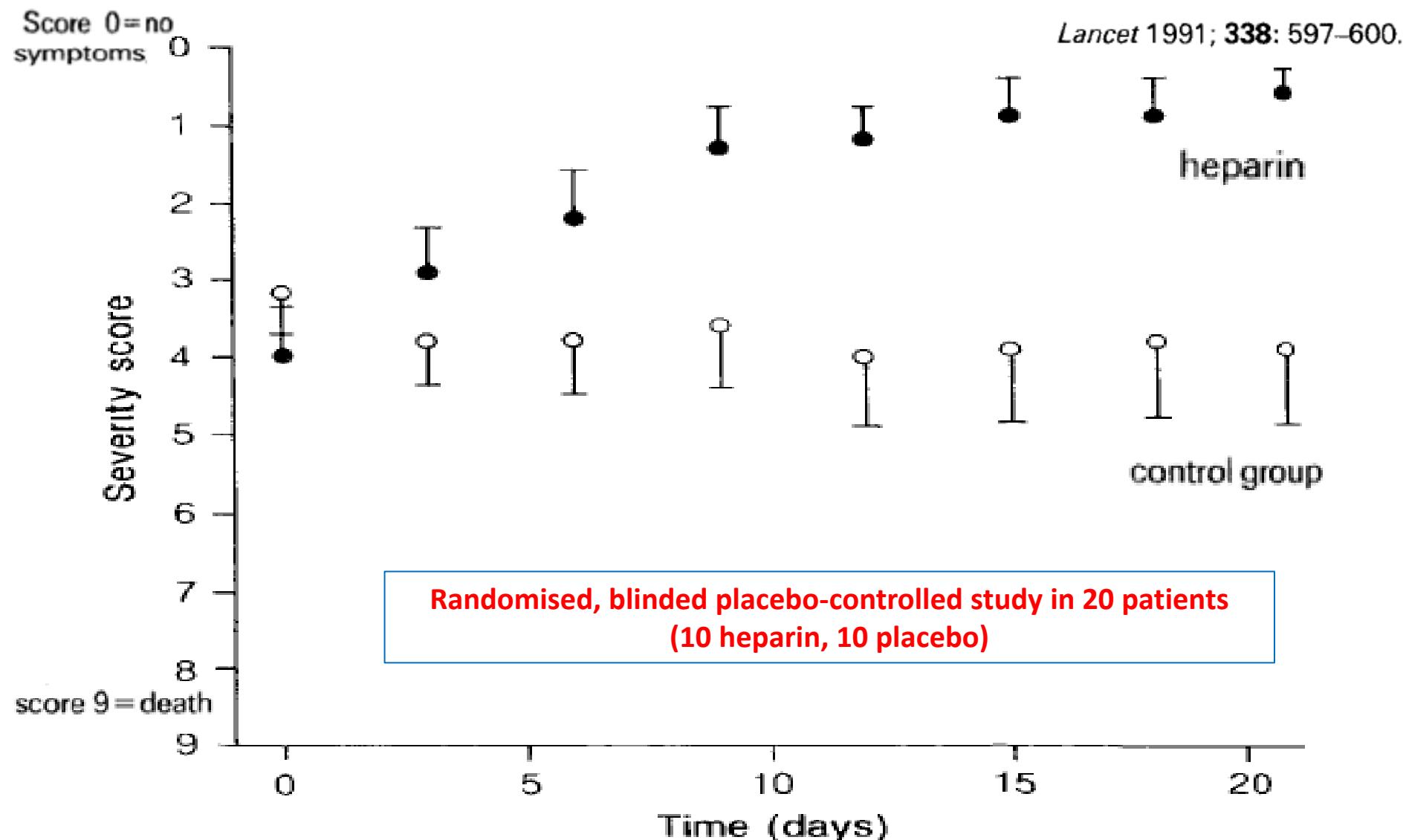
‘ de sauvetage ’

- **A distance**

- AVK ou AOD

# Heparin treatment in sinus venous thrombosis

KARL M. EINHÄUPL ARNO VILLRINGER WOLFGANG MEISTER  
SUSAN MEHRAEIN CHRISTOPH GARNER MAX PELLKOFER  
ROMAN L. HABERL HANS-WALTER PFISTER PETER SCHMIEDEK

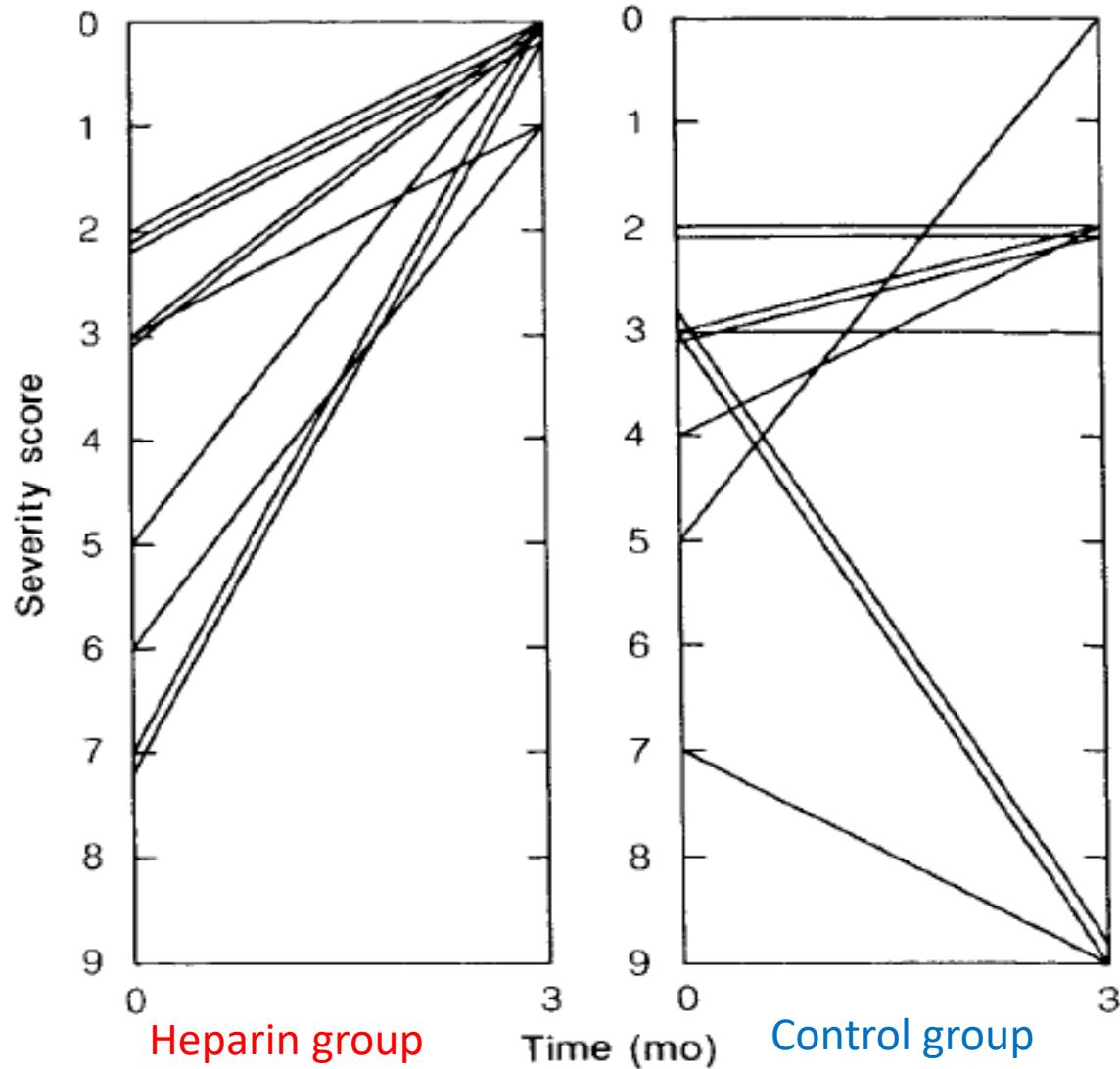


# Heparin treatment in sinus venous thrombosis

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ROMAN L. HABERL HANS-WALTER PFISTER PETER SCHMIEDEK

*Lancet* 1991; **338**: 597–600.

3rd Month



We conclude that anticoagulation with dose-adjusted intravenous heparin is an effective treatment in patients with SVT and that ICH is not a contraindication to heparin treatment in these patients.

*Lancet* 1991; **338**: 597–600.

# Randomized, Placebo-Controlled Trial of Anticoagulant Treatment With Low-Molecular-Weight Heparin for Cerebral Sinus Thrombosis

S. F. T. M. de Brujin and J. Stam

*Stroke* 1999;30:484-488

Stroke  
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Stroke Association<sup>SM</sup>

A Division of American Heart Association 

**TABLE 3. Death and Other Poor Outcomes After 3 and 12 Weeks**

Outcome	Nadroparin (n=30)	Placebo (n=29)	Risk Difference (95% CI)
After 3 weeks			
Death	2	4	
BI score <15	4	3	
Death or BI <15	6 (20%)	7 (24%)	-4% (-25 to 17)
After 12 weeks			
Death	2	4	
Dependent (OHS 3-5)	2	2	
Death or dependence (OHS 3-5)	4 (13%)	6 (21%)	-7% (-26 to 12)

**Conclusions**—Patients with cerebral sinus thrombosis treated with anticoagulants (low-molecular-weight heparin followed by oral anticoagulation) had a favorable outcome more often than controls, but the difference was not statistically significant. Anticoagulation proved to be safe, even in patients with cerebral hemorrhage. (*Stroke*. 1999;30:484-488.)

# Sinus Thrombosis Should Be Treated With Anticoagulation

J. Stam, MD, PhD

## Anticoagulation in Cerebral Venous Sinus Thrombosis

*Are We Treating Ourselves?*

Mohammad Wasay, MD, FRCP, FAAN; Ayeesha Kamran Kamal, MD, FAHA

*There are a lot of things we know for a fact  
that simply aren't so.*

Kevin J. McGowan

# The efficacy and safety of anticoagulation in cerebral vein thrombosis: A systematic review and meta-analysis

Bader Al Rawahi<sup>a,\*</sup>, Mosaad Almegren<sup>b</sup>, Marc Carrier<sup>c</sup>

Thrombosis Research 169 (2018) 135–139

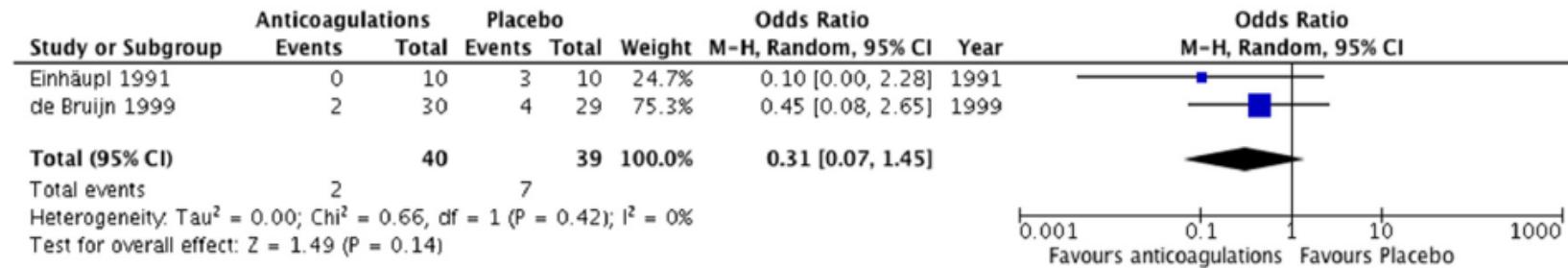


Fig. 4. Forest plot of comparison: anticoagulation versus placebo, outcome: mortality.

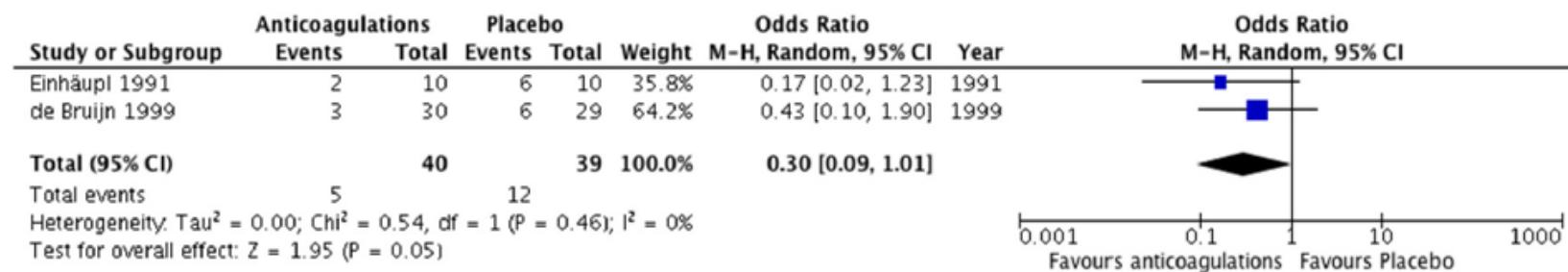


Fig. 5. Forest plot of comparison: anticoagulation versus placebo, outcome: disability.

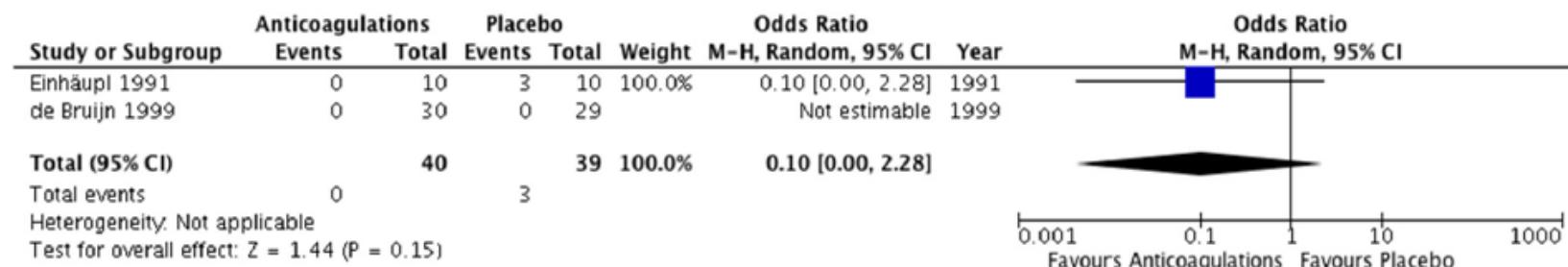


Fig. 6. Forest plot of comparison: anticoagulations versus placebo, outcome: new ICH.

## Diagnosis and Management of Cerebral Venous Thrombosis : A Statement for Healthcare Professionals From the American Heart Association/American Stroke Association

Gustavo Saposnik, Fernando Barinagarrementeria, Robert D. Brown, Jr, Cheryl D. Bushnell, Brett Cucchiara, Mary Cushman, Gabrielle deVeber, Jose M. Ferro and Fong Y. Tsai

6. For patients with CVT, initial anticoagulation with adjusted-dose UFH or weight-based LMWH in full anticoagulant doses is reasonable, followed by vitamin K antagonists, regardless of the presence of ICH<sup>161,171,172,175,181,183</sup> (*Class IIa; Level of Evidence B*). (For further details, refer to “Acute Management and Treatment of CVT: Initial Anticoagulation.”)

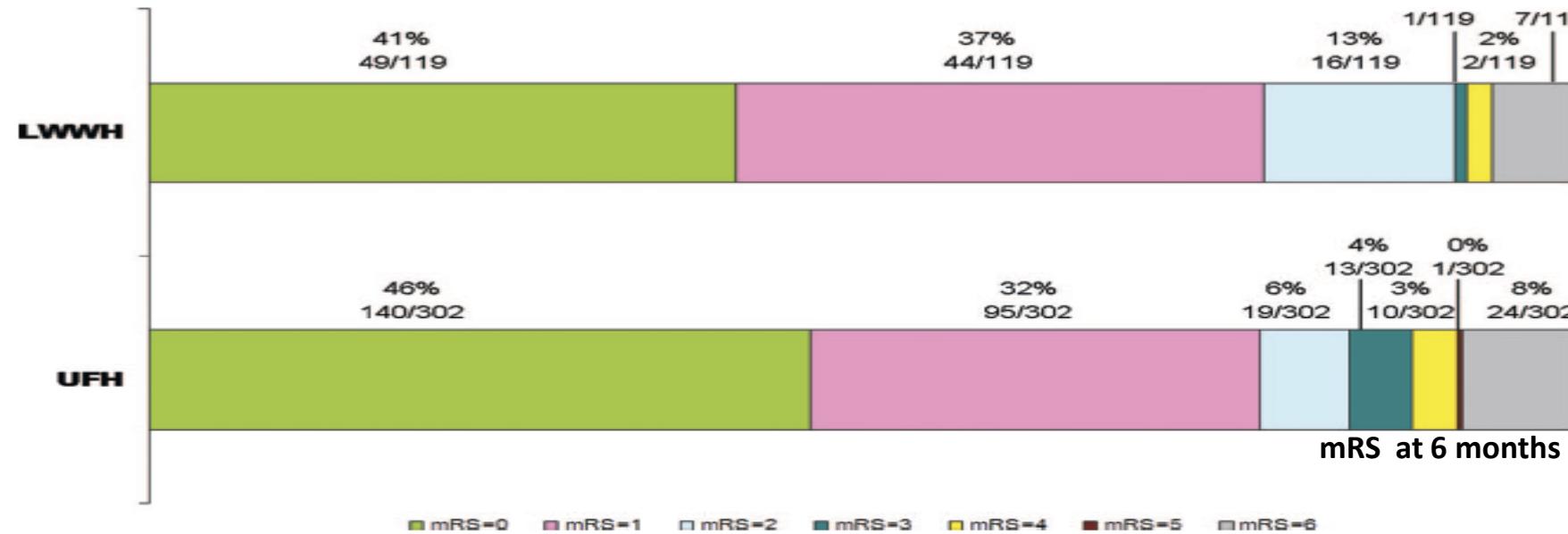
**Objectif: TCA entre 2 et 3**

# Unfractionated or Low-Molecular Weight Heparin for the Stroke Treatment of Cerebral Venous Thrombosis

JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Stroke Association<sup>®</sup>  
A Division of American Heart Association 

Jonathan M. Coutinho, MD; José M. Ferro, MD, PhD; Patrícia Canhão, MD, PhD;  
Fernando Barinagarrementeria, MD; Marie-Germaine Bousser, MD, PhD; Jan Stam, MD, PhD; for the  
ISCVT Investigators



	LMWH n=119	UFH n=302	Univariate Analysis		Multivariate Analysis†	
			Unadjusted OR (95% CI)	P Value	Adjusted OR (95% CI)	P Value
<b>Primary end point</b>						
Independency (mRS 0–2)	92%	84%	2.1 (1.0–4.2)	0.04	2.4 (1.0–5.7)	0.04

**Conclusions**—This nonrandomized study in patients with cerebral venous thrombosis suggests a better efficacy and safety of low-molecular weight heparin over unfractionated heparin. Low-molecular weight heparin seems preferable above unfractionated heparin for the initial treatment of cerebral venous thrombosis. (*Stroke*. 2010;41:2575–2580.)

## Low molecular weight heparin versus unfractionated heparin in cerebral venous sinus thrombosis: a randomized controlled trial

U. K. Misra, J. Kalita, S. Chandra, B. Kumar and V. Bansal

Department of Neurology, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India

**Table 2** Outcome of patients with cerebral venous sinus thrombosis (CVST) in unfractionated heparin (UFH) and low molecular weight heparin (LMWH)

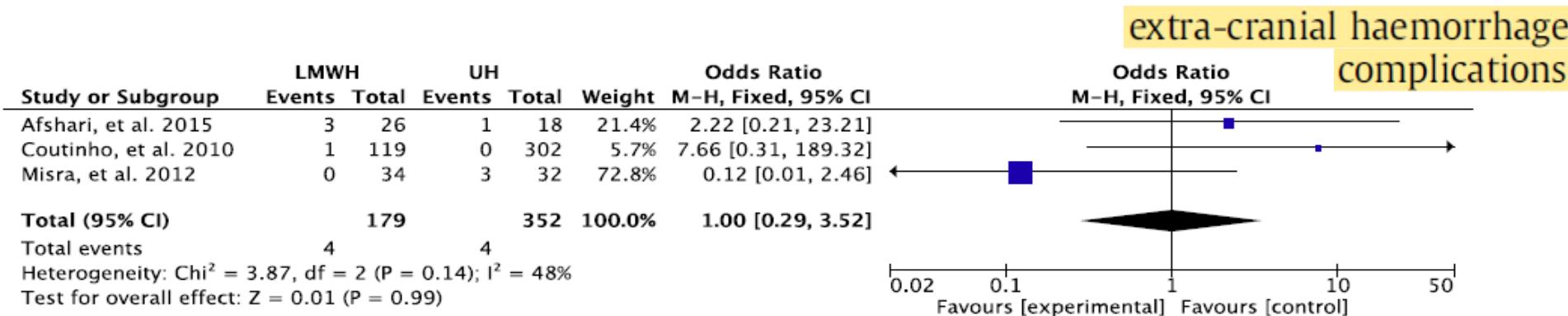
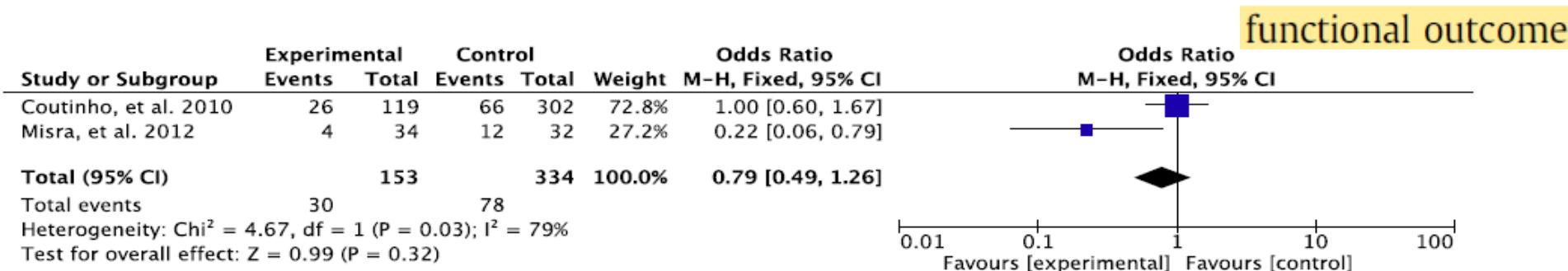
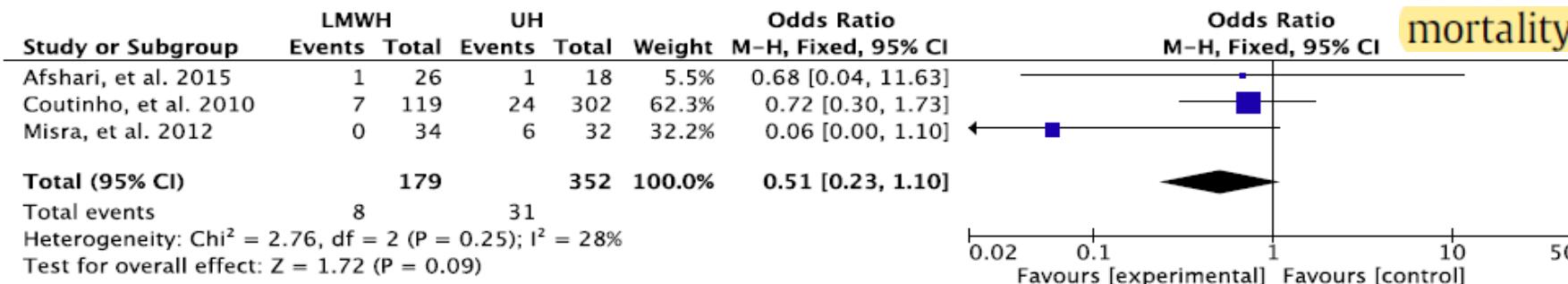
Out come	LMWH <i>N</i> = 34 (%)	UFH <i>N</i> = 32 (%)
Death during hospital	0 (0)	6 (18.8)
3 months functional outcome <sup>a</sup>		
Complete recovery	30 (88.2)	20 (62.5)
Partial recovery	2 (5.9)	1 (3.1)
Poor	2 (5.9)	4 (12.5)

# Low molecular weight heparin versus unfractionated heparin in the management of cerebral venous thrombosis: A systematic review and meta-analysis



Anjum Qureshi <sup>a</sup>, Andrea Perera <sup>b, c, \*</sup>

Annals of Medicine and Surgery 17 (2017) 22–26



## European Stroke Organization guideline for the diagnosis and treatment of cerebral venous thrombosis – endorsed by the European Academy of Neurology

J. M. Ferro<sup>a,b</sup>, M.-G. Bousser<sup>c</sup>, P. Canhão<sup>a,b</sup>, J. M. Coutinho<sup>d</sup>, I. Crassard<sup>c</sup>, F. Dentali<sup>e</sup>, M. di Minno<sup>f,g</sup>, A. Maino<sup>h</sup>, I. Martinelli<sup>h</sup>, F. Masuhr<sup>i</sup>, D. Aguiar de Sousa<sup>a</sup>  and J. Stam<sup>d</sup>, for the European Stroke Organization

**Recommendation** We suggest treating patients with acute CVT with LMWH instead of UFH. This recommendation does not apply to patients with a contraindication for LMWH (e.g. renal insufficiency) or situations where fast reversal of the anticoagulant effect is required (e.g. patients who have to undergo neurosurgical intervention).

**Quality of evidence** Low.

**Strength of recommendation** Weak.

# Définir une gravité potentielle

## Risk Score to Predict the Outcome of Patients with Cerebral Vein and Dural Sinus Thrombosis

Cerebrovascular Diseases

Cerebrovasc Dis 2009;28:39–44

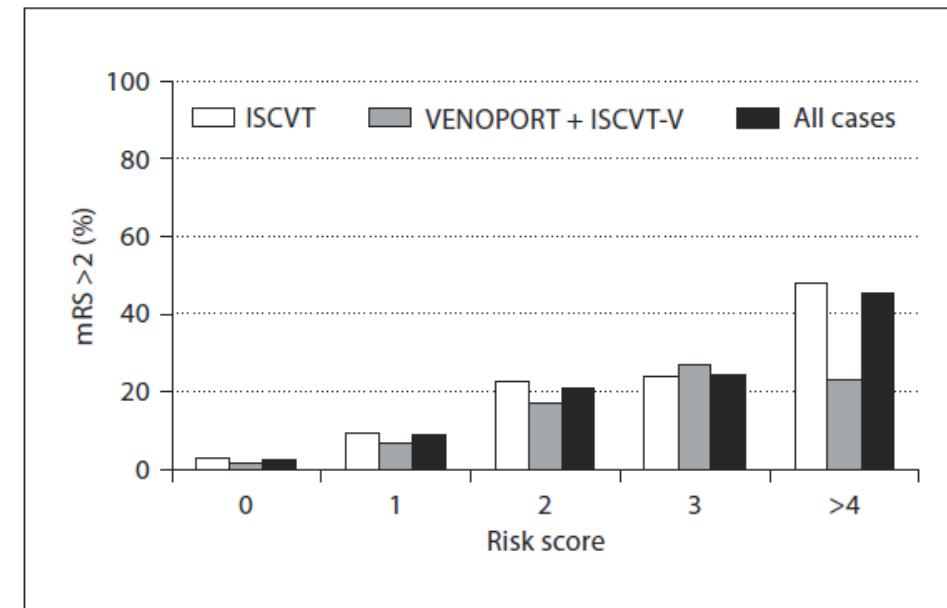
José M. Ferro<sup>a</sup> Helena Bacelar-Nicolau<sup>b</sup> Teresa Rodrigues<sup>b</sup> Leonor Bacelar-Nicolau<sup>b</sup>  
Fernando Barinagarrementeria<sup>h</sup> ISCVT and VENOPORT investigators

**Table 2.** Estimated hazard ratios by Cox model and risk points of the CVT risk score

Prognostic variable	Hazard ratio	p	Risk points
Malignancy	4.53 (2.52–8.15)	<0.001	2
Coma	4.19 (2.20–6.28)	<0.001	2
Thrombosis of the deep venous system	3.03 (1.76–5.23)	<0.001	2
Mental status disturbance	2.18 (1.37–3.46)	0.001	1
Male gender	1.60 (1.01–5.23)	<0.001	1
Intracranial haemorrhage	1.42 (0.88–2.27)	0.148	1

Figures in parentheses are 95% CI.

9



**Fig. 1.** Percentage of poor outcomes by CVT risk score in the derivation and validation samples. mRS = Modified Rankin Scale.

# Outcome Prediction in Cerebral Venous Thrombosis: The IN-REvASC Score

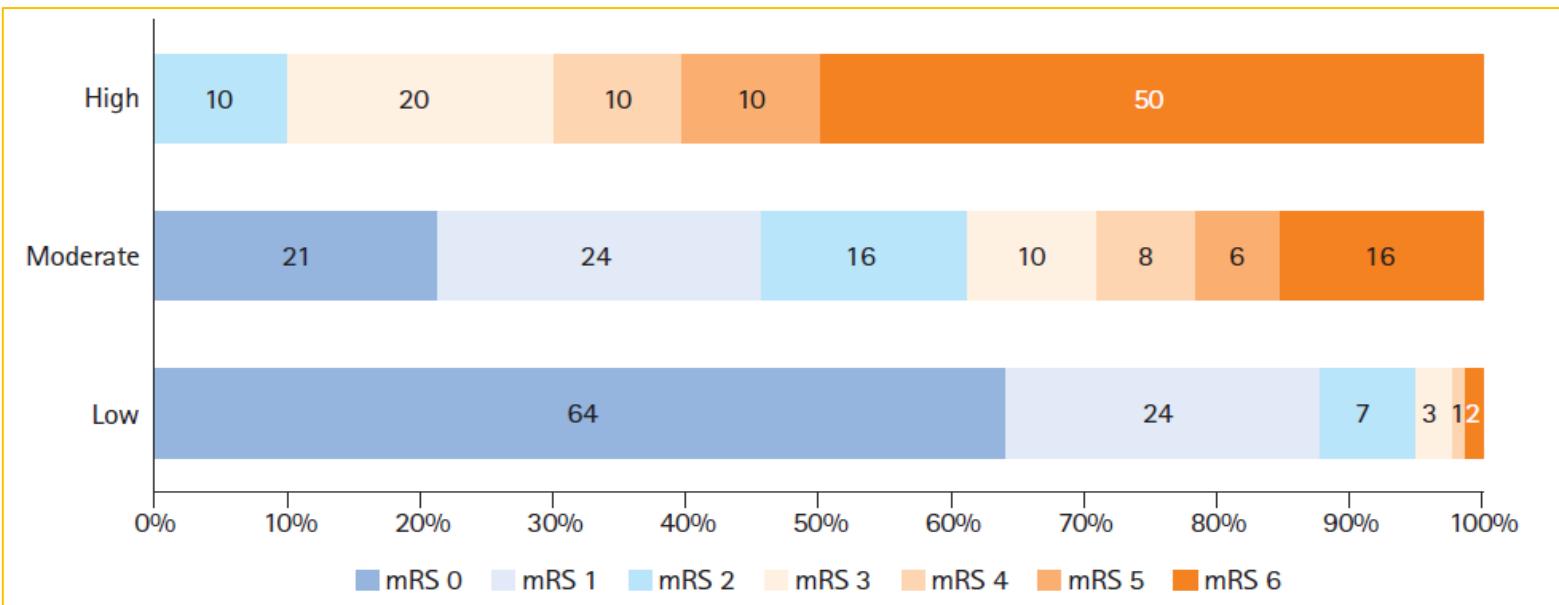
JoS  
JOURNAL OF STROKE

Journal of Stroke 2022;24(3):404-416

Piers Klein,<sup>a</sup> Liqi Shu,<sup>b</sup> Thanh N. Nguyen,<sup>a</sup> James E. Siegler,<sup>c</sup> Setareh Salehi Omran,<sup>d</sup> Alexis N. Simpkins,<sup>e</sup> Diana Aguiar de Sousa,<sup>f</sup> Jonathan M. Coutinho,<sup>m</sup> Shadi Yaghi,<sup>b</sup> for the ACTION-CVT Study Group

- International multicenter retrospective study (01/2015-12/2020) of **1,025 patients**
- Poor outcome, mRS 3-6 and follow-up:** median 375 days (IQR,180 to 747)

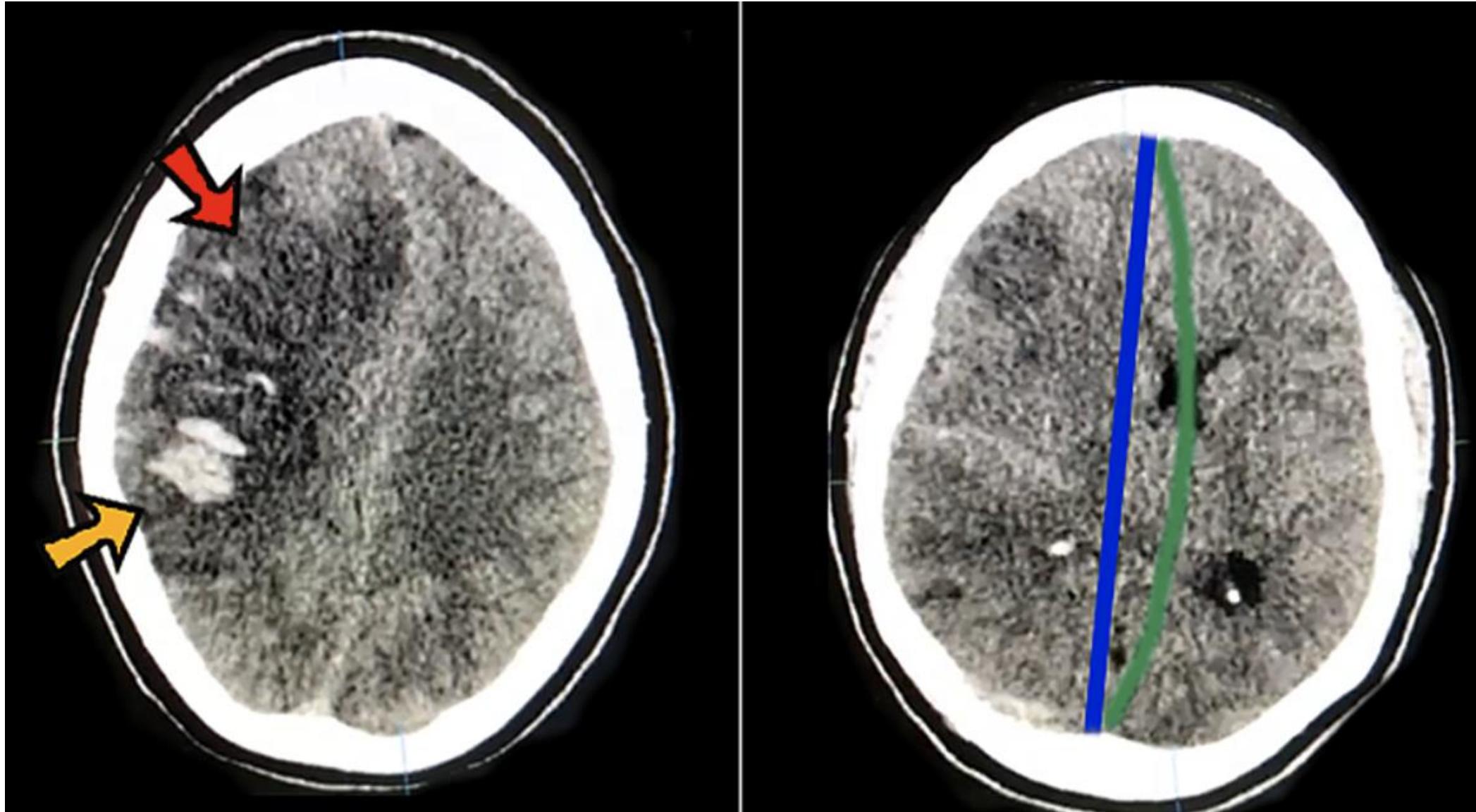
IN-REvASC	Score
Intracranial hemorrhage on admission	No 0 Yes 1
NIHSS	0 0 1–10 2 11–20 4 21–30 6 >30 8
Black Race	No 0 Yes 3
Encephalopathy or coma on presentation	No 0 Yes 4
Age >50	No 0 Yes 3
Anemia (hemoglobin <12.0 g/dL)	No 0 Yes 2
Substance use	No 0 Yes 4
Active Cancer	No 0 Yes 10
Creatinine >1.0	No 0 Yes 2
Total	35



**Probability of poor outcome (mRS D90: 3-6) using the IN-REvASC score**

- Low risk (< 10): 5.1%
- Moderate risk ( $\geq 10$  to < 20): 38.8%
- High risk ( $\geq 20$ ): 90.0%

# ABSENCE de RECANALISATION et AGGRAVATION CLINIQUE et/ou RADIOLOGIQUE



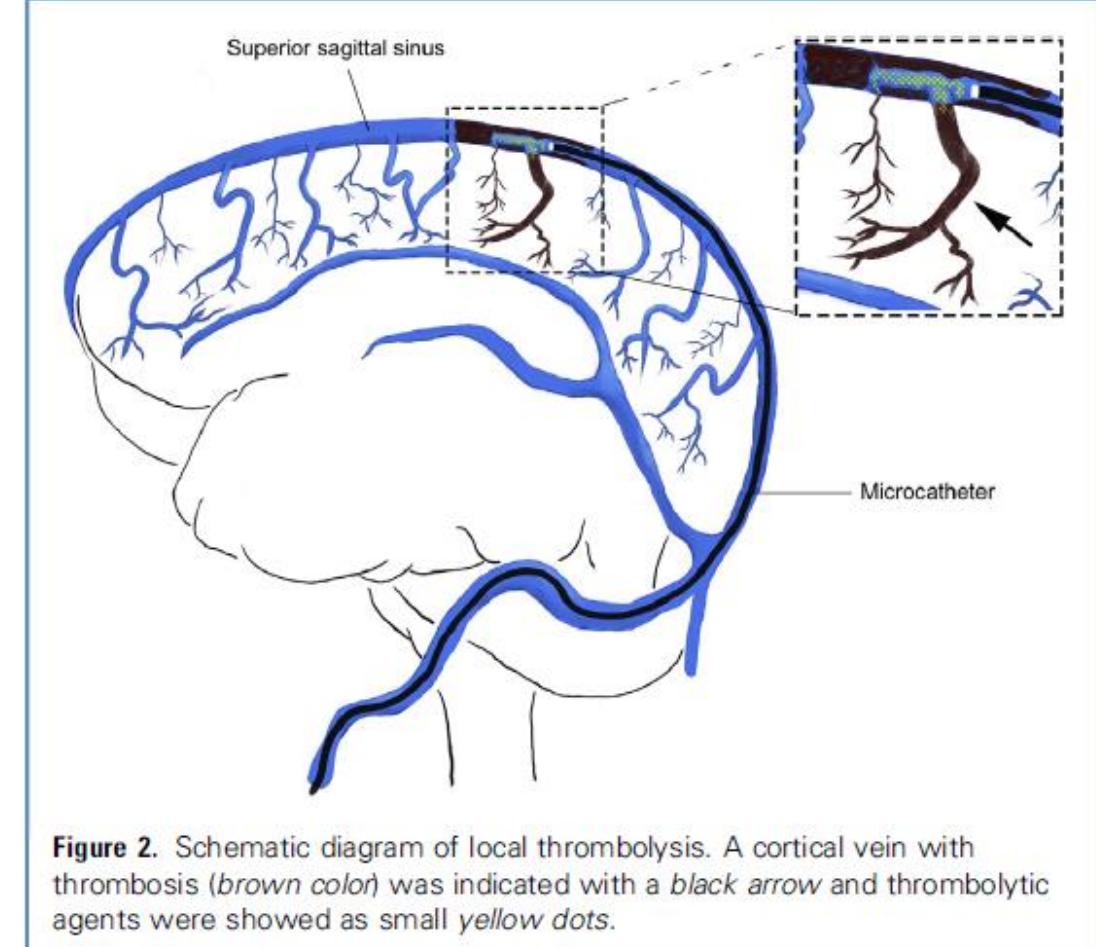
# Traitements de recanalisation

- Phase aiguë

- HNF ou HBPM
  - Thrombolyse
  - Thrombectomie mécanique ( $\pm$  thrombolyse is)
- ] ‘de sauvetage’

- A distance

- AVK ou AOD



**Figure 2.** Schematic diagram of local thrombolysis. A cortical vein with thrombosis (brown color) was indicated with a black arrow and thrombolytic agents were showed as small yellow dots.

# Systemic Thrombolysis for Cerebral Venous and Dural Sinus Thrombosis: A Systematic Review

Cerebrovascular  
Diseases

L.D. Viegas<sup>a</sup> E. Stolz<sup>b</sup> P. Canhão<sup>a</sup> J.M. Ferro<sup>a</sup>

Cerebrovasc Dis 2014;37:43–50

Case characteristics	Canhão et al. [28]		Our study
	local thrombolysis	systemic thrombolysis	systemic thrombolysis
Clinical syndrome			
Isolated intracranial hypertension syndrome	18/134 (13)	4/16 (25)	7/26 (26.9)
Encephalopathy	64/134 (48)	9/16 (56)	17/26 (65.4)
Coma	43/134 (32)	2/16 (13)	2/26 (7.7)
Deep cerebral venous system thrombosis	41/134 (31)	3/16 (23)	5/26 (19.2)
Sinus occlusion			
One	48/131 (37)	8/16 (50)	14/26 (53.8)
Multiple	83/131 (63)	8/16 (51)	12/26 (46.2)
Hemorrhagic lesions on CT/MRI prior to thrombolytic treatment	39/120 (33)	2/5 (40)	2/26 (7.7)
Hemorrhagic complications of thrombolytic treatment			
Intracranial hemorrhage	16/97 (16)	1/9 (11)	3/26 (11.5)
Severe intracranial hemorrhage	5/97 (5)	–	2/26 (7.7)
Extracranial hemorrhage	10/97 (20)	4/9 (44)	5/26 (19.2)
Severe extracranial hemorrhage	2/97 (2)	–	1/26 (3.8)
Recanalization			
Partial	61/132 (46)	4/15 (26)	6/26 (23.1)
Complete	64/132 (48)	6/15 (40)	10/26 (38.5)
mRS score at last available follow-up			
0–1	64/89 (71.9)	9/11 (81.8)	20/25 (80)
2	14/89 (15.7)	1/11 (9.1)	2/25 (8)
3–5	3/89 (3.4)	0/11 (0)	1/25 (4)
6	8/89 (9)	1/11 (9.1)	2/25 (8)

Patients sévères

Clinical syndrome

Isolated intracranial hypertension syndrome

Encephalopathy

Coma

Deep cerebral venous system thrombosis

Sinus occlusion

One

Multiple

Hemorrhagic lesions on CT/MRI prior to thrombolytic treatment

Hemorrhagic complications of thrombolytic treatment

Intracranial hemorrhage

Severe intracranial hemorrhage

Extracranial hemorrhage

Severe extracranial hemorrhage

Recanalization

Partial

Complete

mRS score at last available follow-up

0–1

2

3–5

6

Faible taux recanalisation

Recanalization

Partial

Complete

mRS score at last available follow-up

0–1

2

3–5

6

Canhão et al. [28]

local  
thrombolysis

systemic  
thrombolysis

Our study

systemic  
thrombolysis

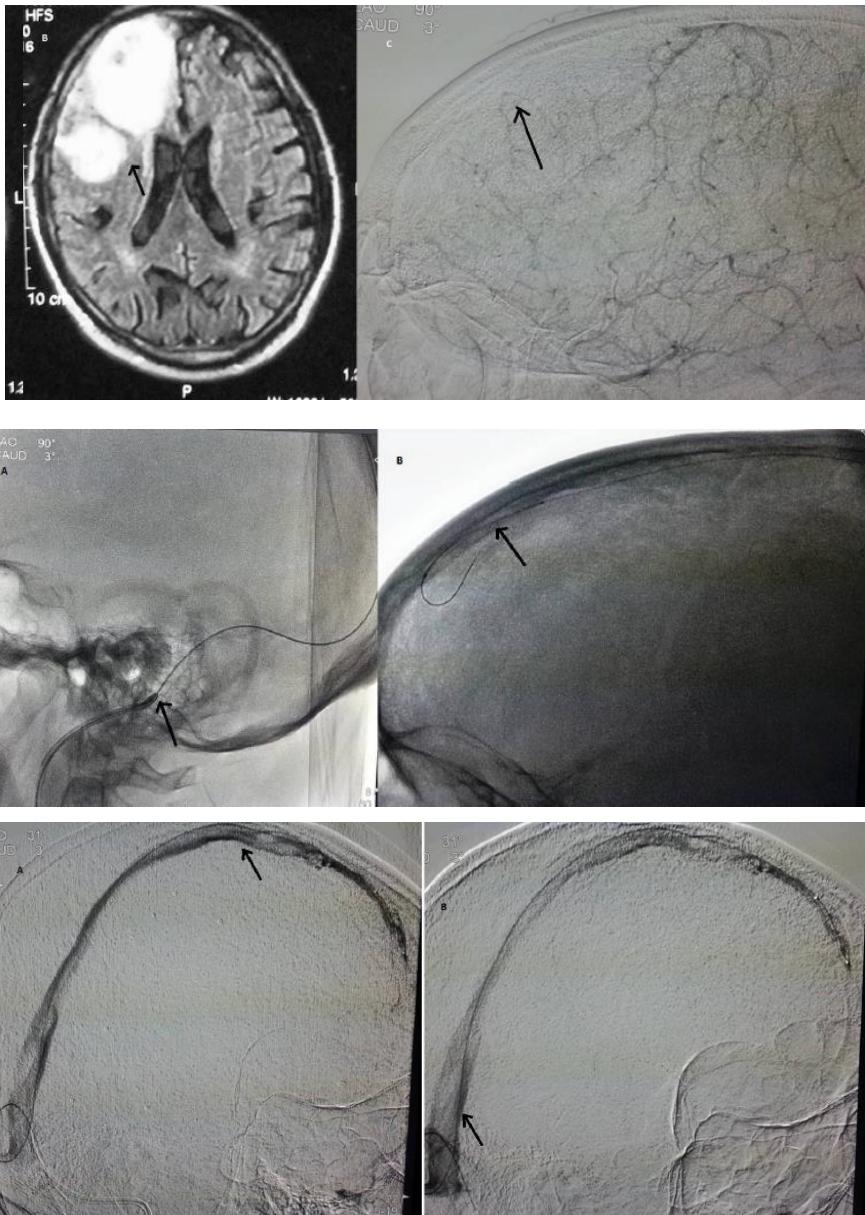
% Complications hémorragiques

Bon pronostic

# Local Intrasinus Thrombolysis for Cerebral Venous Sinus Thrombosis

Lakshmi sudha Prasanna Karanam, Sridhar Reddy Baddam, Vijaya Pamidimukkala, Ramatharakanth Vemuri, Sravanthi Byrapaneni, and Raghavasarma Polavarapu

Department Of Neurointervention Lalitha superspeciality Hospital, Guntur Andhra Pradesh



- **29 patients with severe CVT**
  - *in situ* thrombolysis (rtPA)
  - 3-year period: 04-2013 to 04-2016
- **Results**
  - Recanalization Rate: 100%
  - Prognosis:
    - mRS 0-1: 24/29
    - mRS 2: 3/29
    - mRS 3: 1/29
    - mRS 6: 1/29
- **At 3 months follow-up**
  - 26 patients were asymptomatic
  - 2 had minor symptoms

## European Stroke Organization guideline for the diagnosis and treatment of cerebral venous thrombosis – endorsed by the European Academy of Neurology

J. M. Ferro<sup>a,b</sup>, M.-G. Bousser<sup>c</sup>, P. Canhão<sup>a,b</sup>, J. M. Coutinho<sup>d</sup>, I. Crassard<sup>c</sup>, F. Dentali<sup>e</sup>, M. di Minno<sup>f,g</sup>, A. Maino<sup>h</sup>, I. Martinelli<sup>h</sup>, F. Masuhr<sup>i</sup>, D. Aguiar de Sousa<sup>a</sup>  and J. Stam<sup>d</sup>, for the European Stroke Organization

*Recommendation* We cannot provide a recommendation on thrombolysis for CVT.

*Quality of evidence* Very low.

*Strength of recommendation* Inconclusive.

*Good clinical practice point* We suggest not using thrombolysis in patients with acute CVT with a pre-treatment low risk of poor outcome.

# Traitements de recanalisation

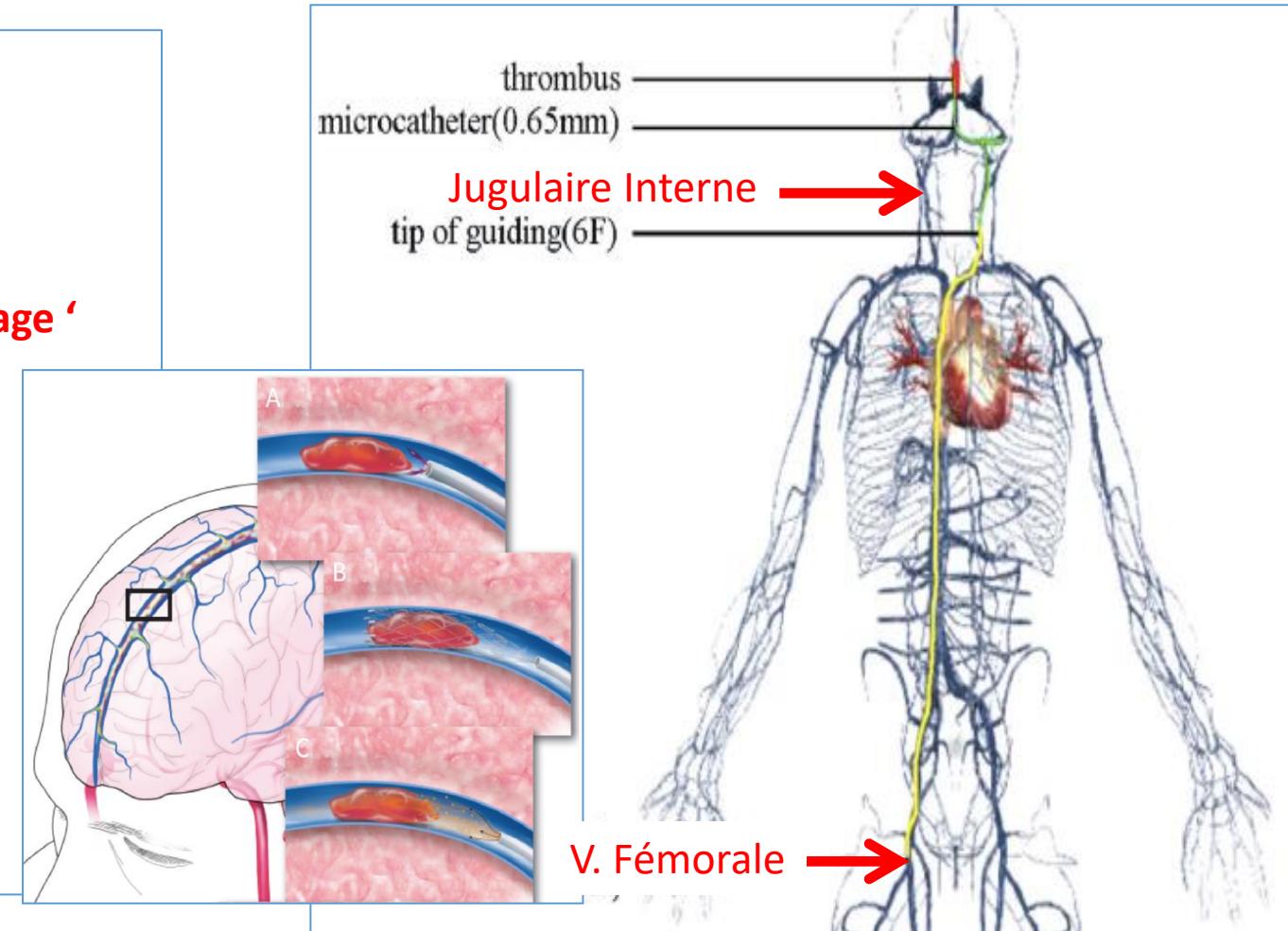
- **Phase aiguë**

- HNF ou HBPM
- Thrombolyse
- Thrombectomie mécanique ( $\pm$  thrombolyse)

‘de sauvetage’

- **A distance**

- AVK ou AOD



Stroke. 2015;46:1263-1268

## Systematic Review of 185 Cases

Fazeel M. Siddiqui, MD; Sudeepa Dandapat, MD; Chirantan Banerjee, MBBS;

Susanna M. Zuurbier, MD; Mark Johnson, MD; Jan Stam, MD, PhD; Jonathan M. Coutinho, MD, PhD

- **42 études publiées** entre Janvier 1995 et Février 2014 → **185 patients**
- 47% were stuporeux/comateux, 60% with ICH, and 42% infarctus étendu avec effet de masse
- 60% Traitement de l'ICH et 71% thrombolyse intra-sinus

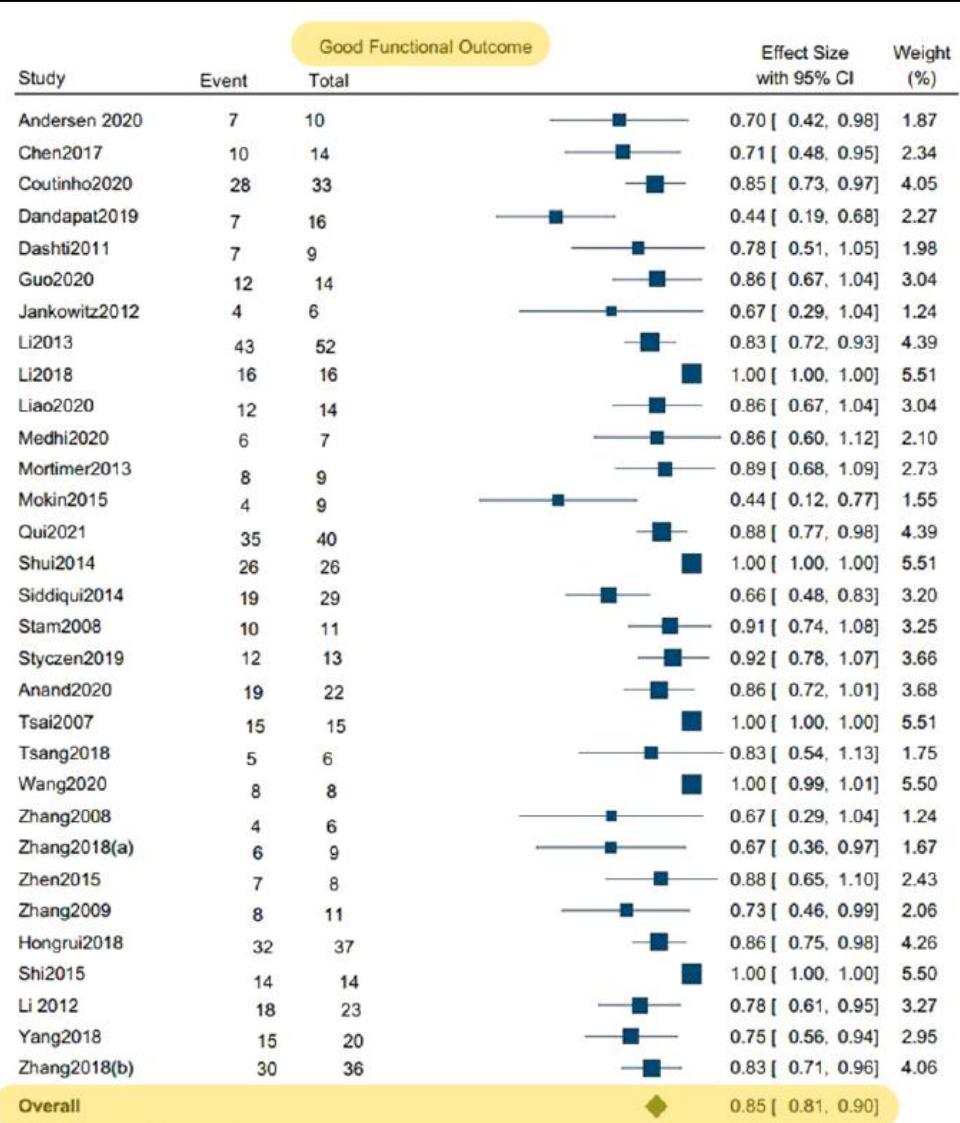
Outcomes	n/N (%)*
<b>Clinical outcomes</b>	
Good (mRS 0–2)	156/185 (84%)
Poor (mRS 3–5)	7 (4%)
Death	22 (12%)
<b>Recanalization</b>	
No recanalization	9/184 (5%)
Partial recanalization	38/184 (21%)
Complete recanalization	137/184 (74%)
Periprocedural complications including death	48/185 (26%)
New or increased ICH	18/185 (10%)

*Conclusions*—Our systematic review suggests that mechanical thrombectomy is reasonably safe but controlled studies are required to provide a definitive answer on its efficacy and safety in patients with cerebral venous thrombosis.

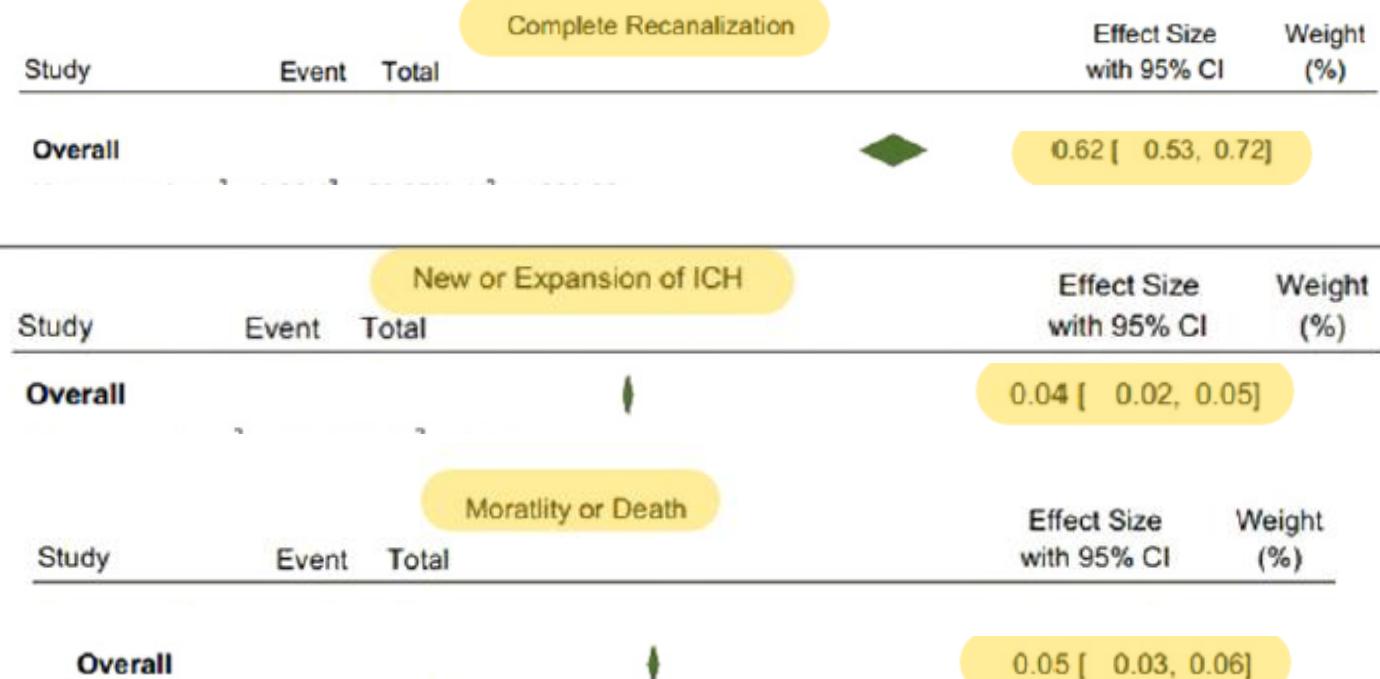
# Safety and efficacy of endovascular thrombectomy in patients with severe cerebral venous thrombosis: A meta-analysis

Journal of Central Nervous System Disease  
 Volume 14: 1–17  
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Gaurav Nepal<sup>1</sup> , Sanjeev Kharel<sup>1</sup> , Riwaj Bhagat<sup>2</sup> 

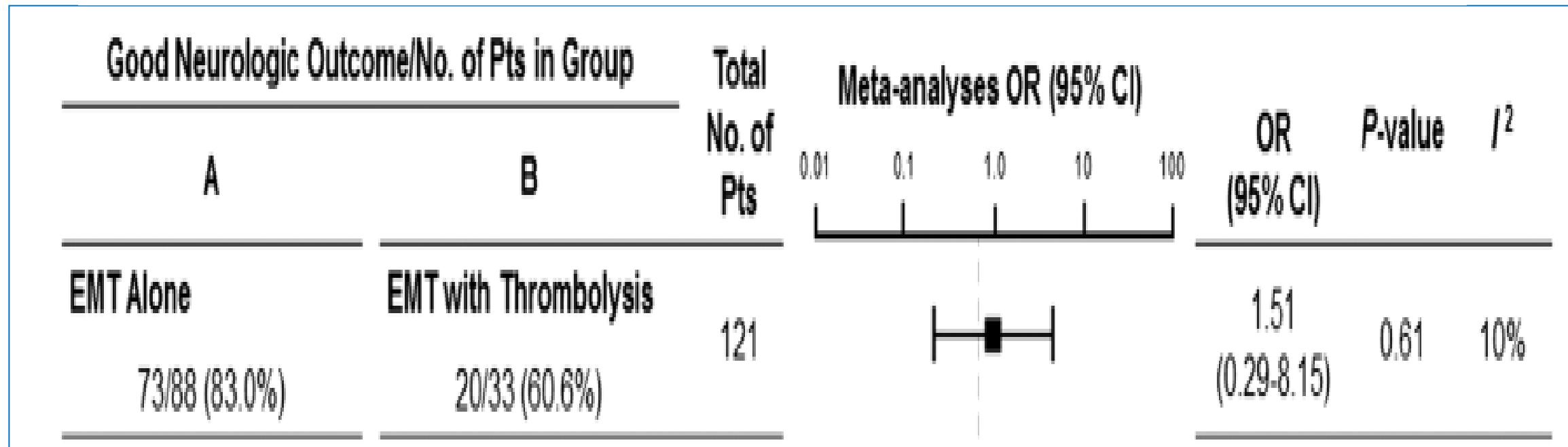


- **33 studies 2007-2021**
  - 32 retrospective studies
  - **610 patients treated with EVT**



## Endovascular mechanical thrombectomy for cerebral venous sinus thrombosis: a systematic review

Adeel Ilyas, Ching-Jen Chen, Daniel M Raper, Dale Ding, Thomas Buell,  
Panagiotis Mastorakos, Kenneth C Liu



### Conclusions

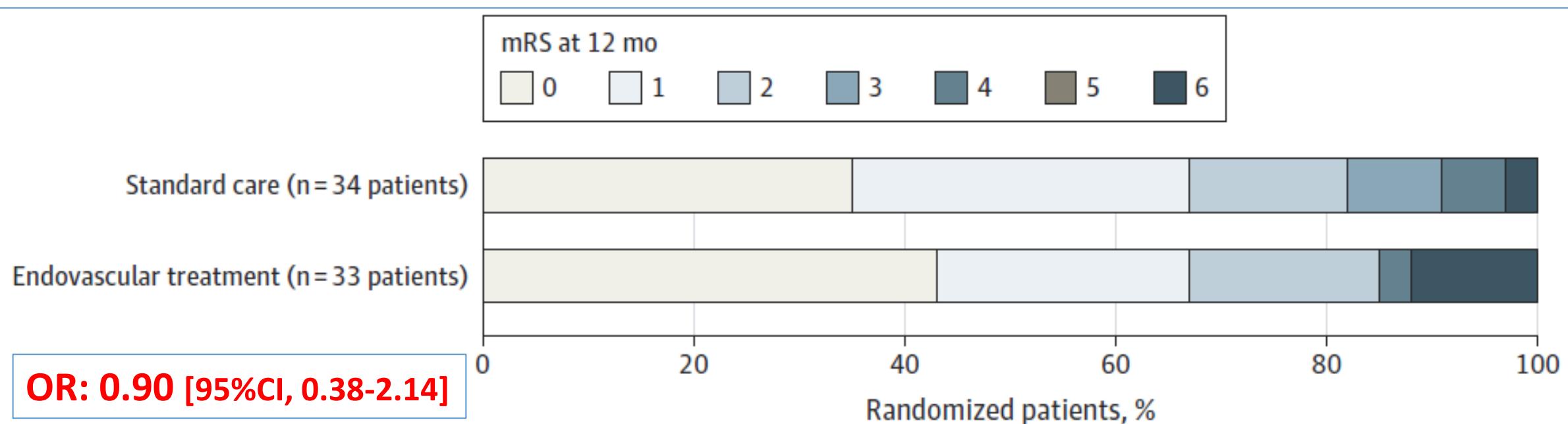
- EMT is an **effective salvage therapy** for refractory CVST, with a **reasonable safety profile**.
- **Chemical thrombolysis**, in conjunction with EMT, did not appear to result in additional harm or benefit.
- Further analysis is warranted to determine predictors of success after EMT for CVST.

# Effect of Endovascular Treatment With Medical Management vs Standard Care on Severe Cerebral Venous Thrombosis The TO-ACT Randomized Clinical Trial

JAMA Neurol. 2020;77(8):966-973.

Jonathan M. Coutinho, MD, PhD; Susanna M. Zuurbier, MD, PhD; Marie-Germaine Bousser, MD, PhD; Xunming Ji, MD, PhD; Patricia Canhão, MD, PhD;

- **67** Adult patients with radiologically confirmed CVT
- **≥ 1 risk factor for a poor outcome**
  - Mental status disorder, coma state ( $\approx 66\%$ )
  - Intracerebral hemorrhage ( $\approx 70\%$ ), or thrombosis of the deep venous system ( $\approx 40\%$ )
- Mechanical thrombectomy (91%), pharmacological thrombolysis (52%), or a combination of both  
**Versus** heparin in a therapeutic dose (unfractionated or LMW heparin)
- **Primary end point:** % of patients with a good outcome at **12 months** (mRS 0-1)



# Effect of Endovascular Treatment With Medical Management vs Standard Care on Severe Cerebral Venous Thrombosis

## The TO-ACT Randomized Clinical Trial

JAMA Neurol. 2020;77(8):966-973.

Jonathan M. Coutinho, MD, PhD; Susanna M. Zuurbier, MD, PhD; Marie-Germaine Bousser, MD, PhD; Xunming Ji, MD, PhD; Patricia Canhão, MD, PhD;

Table 2. Primary and Secondary End Points

End point	No. (%)		RR (95% CI)
	EVT with standard care (n = 33)	Standard care only (n = 34)	
<b>Primary</b>			
mRS score 0-1 at 12 mo	22 (67)	23 (68)	0.99 (0.71-1.38)
<b>Secondary</b>			
mRS score 0-2 at 12 mo	28 (85)	28 (82)	1.03 (0.83-1.27)
mRS score at 12 mo, median (IQR)	1 (0-2)	1 (0-2)	0.90 (0.38-2.14) <sup>a</sup>
mRS score 0-1 at 6 mo	18 (55)	14 (41)	1.32 (0.80-2.20)
mRS score 0-2 at 6 mo	27 (82)	29 (85)	0.96 (0.78-1.19)
Surgical intervention related to CVT	4 (12)	4 (12)	1.03 (0.28-3.78)
Complete recanalization			
Superior sagittal sinus at 6-12 mo <sup>b</sup>	22 (79)	15 (52)	1.52 (1.02-2.27)
Straight sinus at 6 mo <sup>c</sup>	27 (96)	24 (86)	1.13 (0.95-1.33)

Table 3. Safety End Points

End point	No. (%)		P value
	EVT with standard care (n = 33)	Standard care only (n = 34)	
<b>Safety</b>			
<b>Mortality</b>			
At 12 mo	4 (12)	1 (3)	.20
At 6 mo	4 (12)	1 (3)	.20
New symptomatic ICH	1 (3)	3 (9)	.61
Major hemorrhagic complication	6 (18)	8 (24)	.59
<b>Serious adverse events</b>			
Any serious adverse event	11 (33)	12 (35)	.87
Perforation venous system during EVT	3 (9)	NA	NA
Decompressive hemicraniectomy	3 (9)	2 (6)	.67
External ventricular drain	1 (3)	3 (9)	.61
Seizure	1 (3)	10 (30)	.006
Status epilepticus	1 (3)	2 (6)	>.99

## CONCLUSION

Endovascular treatment did not improve clinical outcome in patients with severe cerebral venous thrombosis

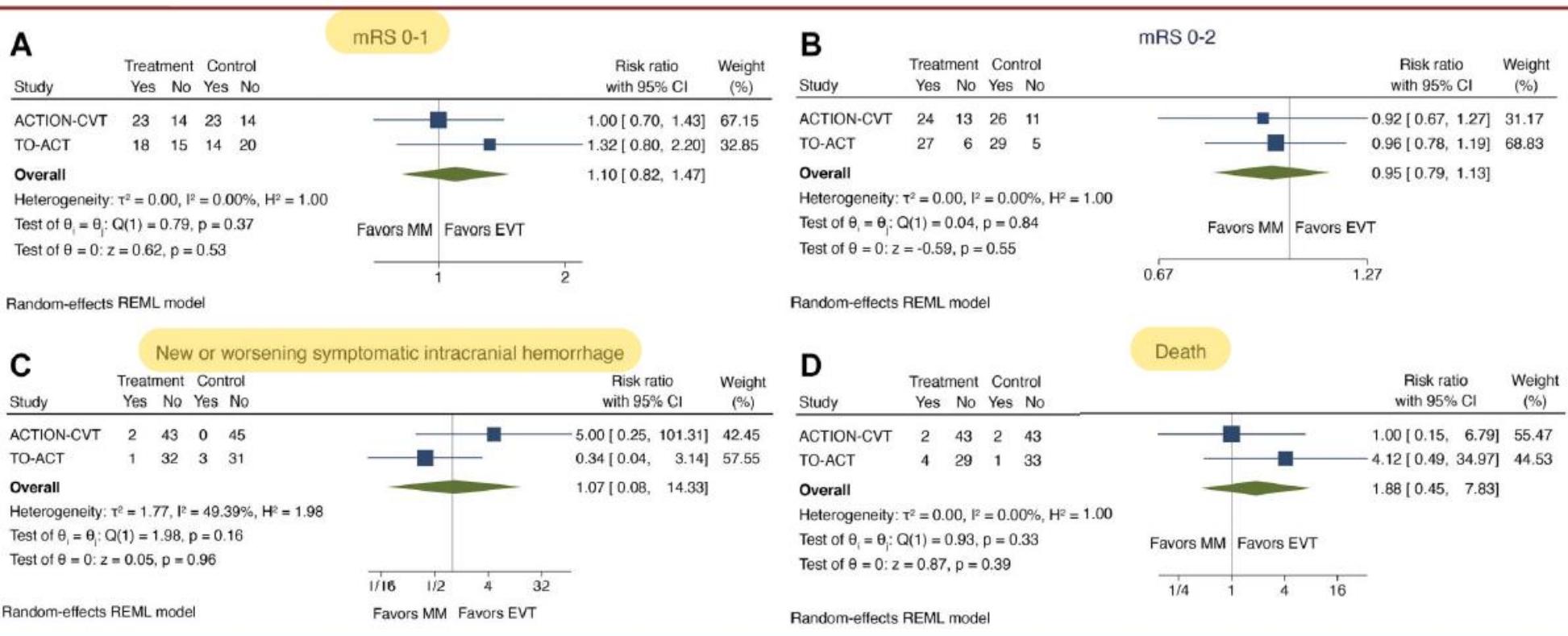
James E. Siegler, MD \*Liqi Shu, MD †Shadi Yaghi, MD ‡Setareh Salehi Omran, MD §

# Endovascular Therapy for Cerebral Vein Thrombosis: A Propensity-Matched Analysis of Anticoagulation in the Treatment of Cerebral Venous Thrombosis

on behalf of the ACTION-CVT

Neurosurgery 00:1–7, 2022

- Comparison EVT vs best medical treatment: **retrospective multinational cohort of 987 CVT**
- Across 4 countries (USA, Italy, Switzerland, and New Zealand) and 27 sites (2015–2020),



**CONCLUSION:** In this large observational cohort, there was no evidence of benefit with EVT for CVT. These findings corroborate the results from the TO-ACT trial.

# Cerebral venous thrombosis: a practical guide

**Table 5** Prognostic score for CVT<sup>60</sup>

Prognostic variable	Risk points
Malignancy	2
Coma	2
Deep venous thrombosis	2
Mental status disturbances	1
Male sex	1
Intracranial haemorrhage	1

<3: Low risk of poor outcome.

≥3: High risk of poor outcome.<sup>53</sup>

CVT, cerebral venous thrombosis

