La thrombolyse dans l'embolie pulmonaire

Dr.Hamzaoui O

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Introduction

Mortalité et la morbidité associée à une embolie pulmonaire est encore élevée malgré le progrès réalisé en matière de l'imagerie et les différentes options thérapeutiques qui existent

Le taux de mortalité de l'embolie pulmonaire est très variable et dépends de la sévérité de l'embolie pulmonaire: entre 1 et 50% dans les trois premiers mois

L'embolie pulmonaire altère la qualité de vie des patients en se compliquant de cœur pulmonaire chronique chez un grand nombre de patients

Estimated Case Fatality Rate of Pulmonary Embolism, 1979 to 1998

Paul D. Stein, MD, Fadi Kayali, MD, and Ronald E. Olson, PhD

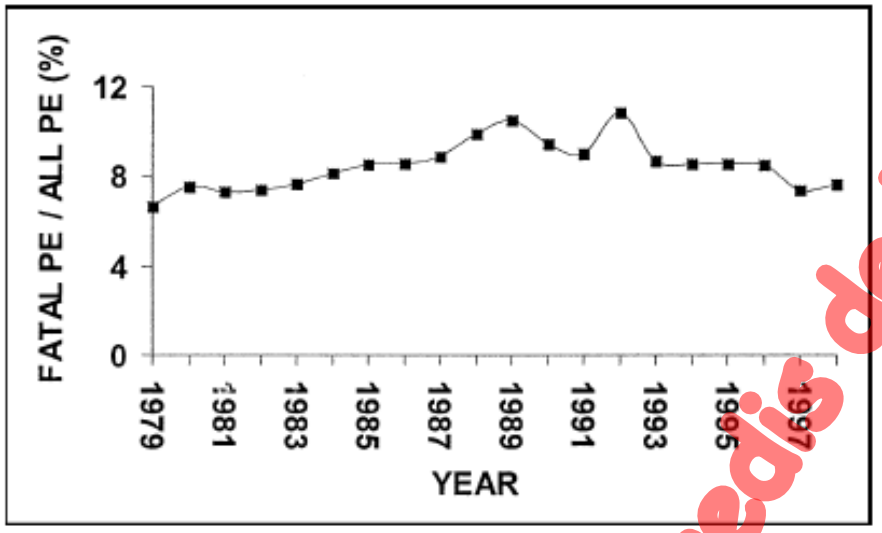

FIGURE 1. Estimated case fatality rate of PE from 1979 to 1998.

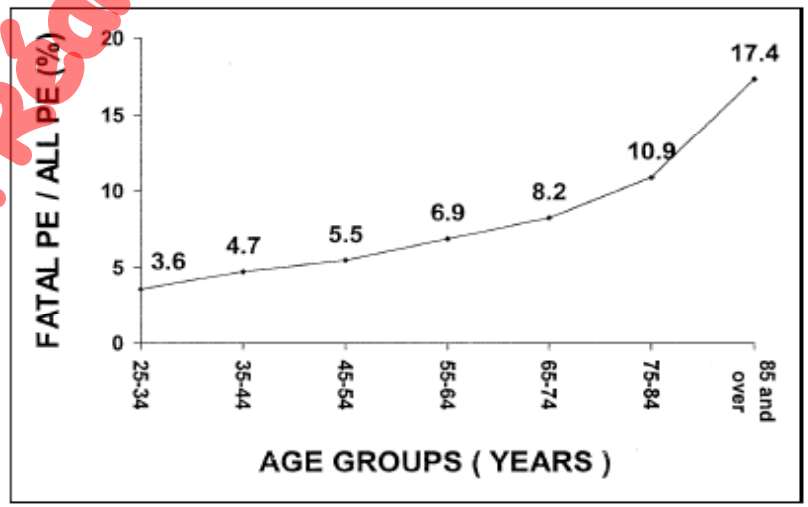

FIGURE 2. Estimated case fatality rates of PE according to decades of age. The estimated case fatality rates are the average of yearly values over a 20-year period.

THE NEW ENGLAND JOURNAL OF MEDICINE

THE CLINICAL COURSE OF PULMONARY EMBOLISM

JEFFREY L. CARSON, M.D., MARK A. KELLEY, M.D., AMY DUFF, M.H.S., JOHN G. WEG, M.D., WILLIAM J. FULKERSON, M.D., HAROLD I. PALEVSKY, M.D., J. SANFORD SCHWARTZ, M.D., B. TAYLOR THOMPSON, M.D., JOHN POPOVICH, JR., M.D., THOMAS E. HOBBINS, M.D., MARGARET A. SPERA, R.N., ABASS ALAVI, M.D., AND MICHAEL L. TERRIN, M.D., M.P.H.

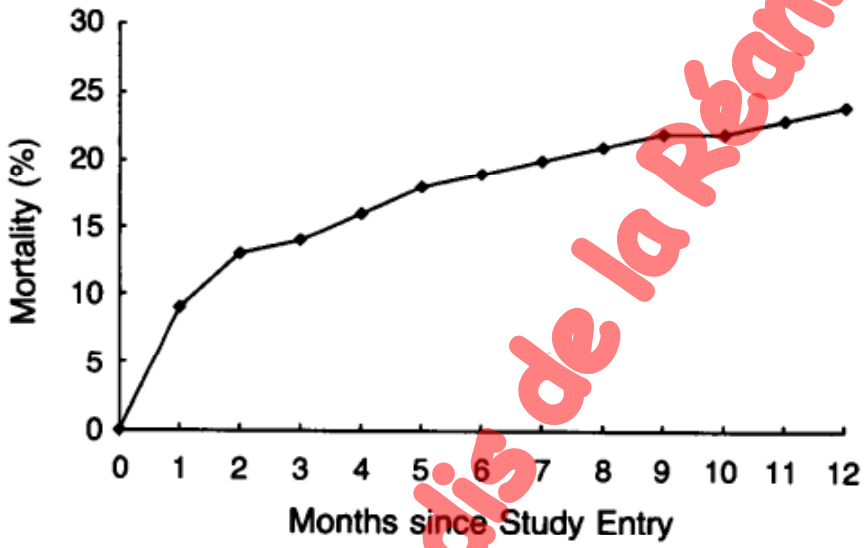

Table 4. Characteristics Associated with One-Year Mortality in the 399 Study Patients.*

CHARACTERISTIC	RELATIVE RISK (95% CI)	
	DERIVATION DATA SET	VALIDATION DATA SET
Cancer	3.8 (2.3–6.4)	4.4 (2.1–9.5)
Left-sided congestive heart failure	2.7 (1.5–4.6)	2.6 (1.2–5.7)
Chronic lung disease	2.2 (1.2–4.0)	3.2 (1.3–7.4)
Age >60 yr	2.2 (1.2–4.1)	1.4 (0.5–3.4)

May 7, 1992

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION
American Heart Association. Learn and Live.
Circulation 2008;

Clinical Predictors for Fatal Pulmonary Embolism in 15 520 Patients With Venous Thromboembolism: Findings From the Registro Informatizado de la Enfermedad TromboEmbolica venosa (RIETE) Registry

Silvy Laporte, Patrick Mismetti, Hervé Décousus, Fernando Uresandi, Remedios Otero, Jose Luis Lobo, Manuel Monreal and the RIETE Investigators

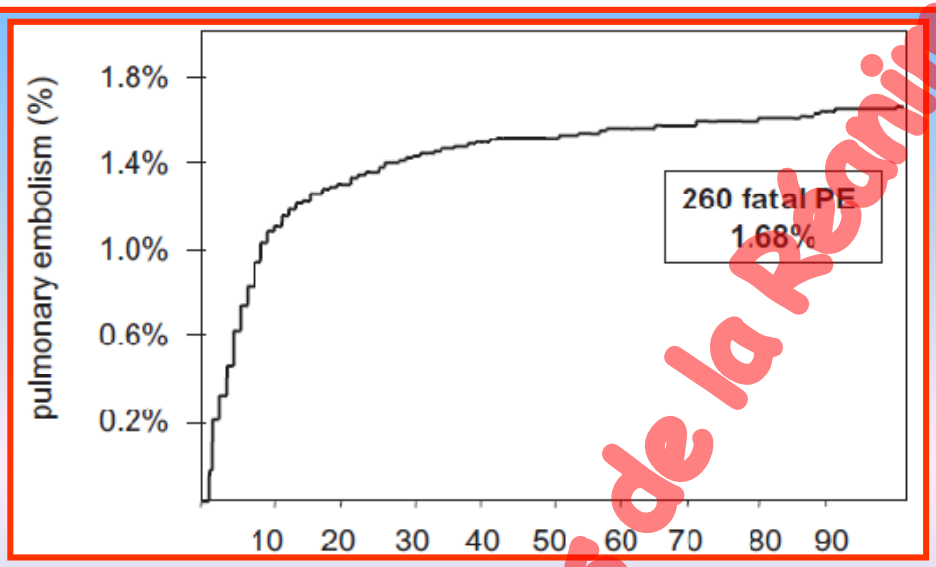

Table 3. Clinical Predictors for Fatal Pulmonary Embolism Within 3 Months (Multivariable Analysis, Training and Validation Models)*

	Training Model (n=10 346)			Validation Model (n=5174)		
	Odds Ratio	95% Confidence Interval	*P*	Odds Ratio	95% Confidence Interval	*P*
Index venous thromboembolism						
Distal/proximal deep-vein thrombosis	1	...		1	...	
Symptomatic nonmassive pulmonary embolism	5.66	3.79–8.44	<0.0001	5.42	3.19–9.20	<0.0001
Symptomatic massive pulmonary embolism	16.3	8.50–31.4		17.5	7.45–41.2	
Immobilisation >4 days for neurological disease	2.80	1.61–4.86	0.0001	4.90	2.71–8.84	<0.0001
Age >75 years	2.31	1.67–3.21	<0.0001	2.54	1.58–3.81	<0.0001
Cancer	2.40	1.72–3.26	<0.0001	2.04	1.29–3.21	0.0022
Cardiac or respiratory disease†	1.89	1.35–2.65	0.0001	1.34	0.84–2.16	0.22
Recent surgery†	0.53	0.29–0.96	0.034	0.54	0.23–1.25	0.15

En se basant sur des considérations physiopathologiques et leurs impacts sur le pronostic des patients, l'ancienne classification de l'embolie pulmonaire:

-Massive

-Submassive

-Non massive

A été remplacé par une identification de l'embolie pulmonaire sévère en se basant sur le « Early Death Risk »

European Heart Journal (2008) **29**, 2276–2315
doi:10.1093/eurheartj/ehn310

ESC GUIDELINES

Guidelines on the diagnosis and management of acute pulmonary embolism

The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC)

Table 5 Risk stratification according to expected pulmonary embolism-related early mortality rate

PE-related early MORTALITY RISK		RISK MARKERS: CLINICAL (shock or hypotension)	RISK MARKERS: RV dysfunction	RISK MARKERS: Myocardial injury	Potential treatment implications
HIGH >15%		+	(+)[a]	(+)[a]	Thrombolysis or embolectomy
NON HIGH	Intermediate 3–15%	–	+	+	Hospital admission
			+	–	
			–	+	
	Low <1%	–	–	–	Early discharge or home treatment

La thrombolyse dans l'embolie pulmonaire c'est une histoire de 40 ans de travaux cliniques avec:

-Passé

-Présent

-Futur

Le passé

Angiographic and haemodynamic benefits

Bleeding complications

Circulation
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Massive Pulmonary Embolism

Nils Kucher, Elisa Rossi, Marisa De Rosa and Samuel Z. Goldhaber

TABLE 1. Patient Characteristics (n=2392)

	Massive PE (n=108)	Non–Massive PE (n=2284)	*P*
Age, mean±SD, y	64±17	62±17	0.12
Age >70 y	43 (40)	818 (36)	0.40
Men	44 (41)	1024 (45)	0.40
Systolic pressure, mean±SD, mm Hg	75±10	131±23	<0.001
Heart rate, mean±SD, bpm	117±28	98±21	<0.001
Days from symptom onset to diagnosis, mean±SD	(1.2±2.1)	(4.1±5.9)	<0.001
Chest pain	41 (40)	1127 (50)	0.06
Dyspnea	86 (81)	1876 (82)	0.77
Syncope	41 (39)	271 (12)	<0.001
Cough	10 (9)	483 (21)	0.003
Hemoptysis	2 (2)	160 (7)	0.040
Right ventricular hypokinesis	38/61 (62)	405/1035 (39)	0.001
Right heart thrombus	6/62 (10)	44/1052 (4)	0.042
LV ejection fraction <40%	13/88 (15)	104/1777 (6)	0.001
Concomitant deep vein thrombosis	34/105 (32)	1150/2276 (50)	<0.001

Circulation 2006;

Circulation
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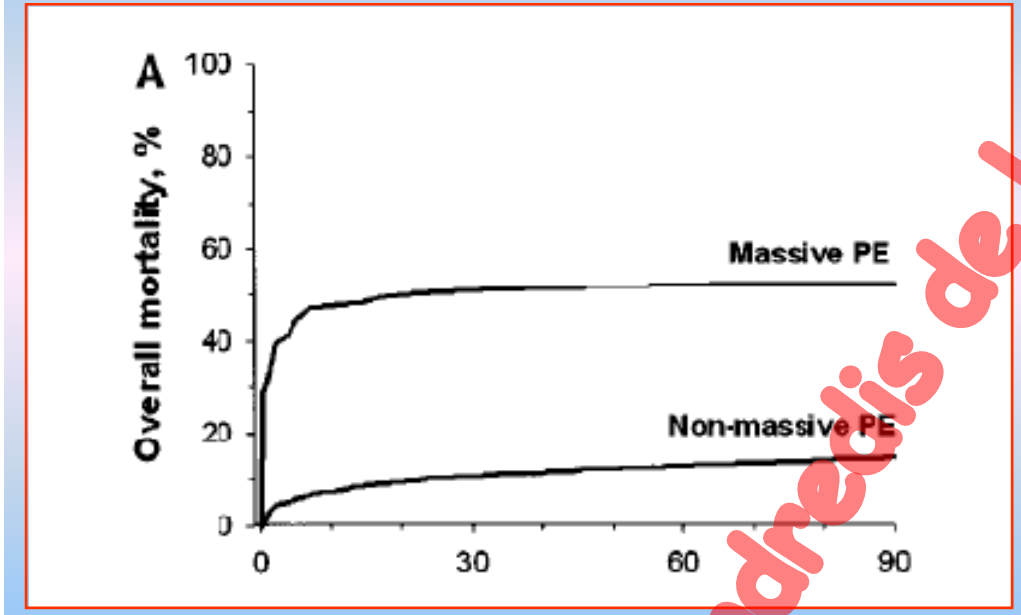
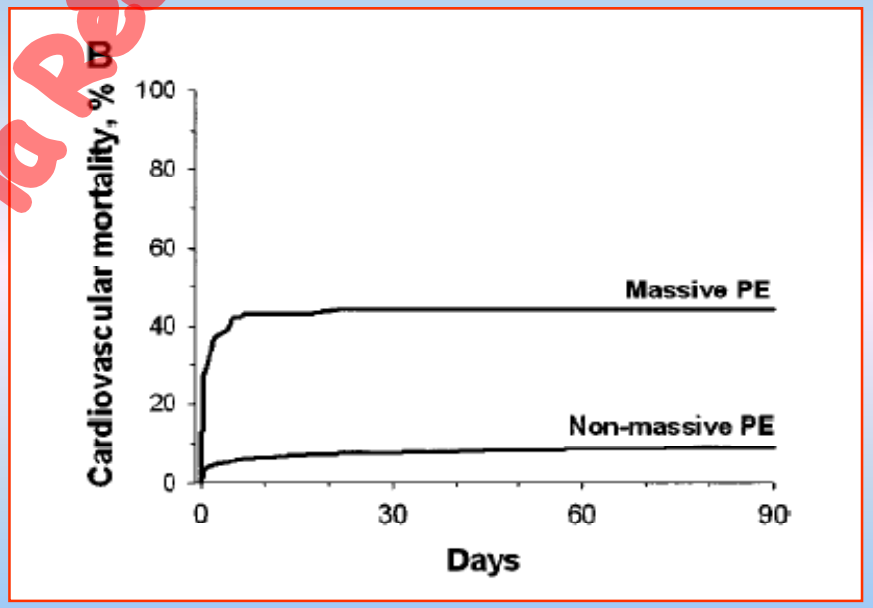
Massive Pulmonary Embolism

Nils Kucher, Elisa Rossi, Marisa De Rosa and Samuel Z. Goldhaber





Circulation 2006;

Comparison of Streptokinase and Heparin in Treatment of Isolated Acute Massive Pulmonary Embolism*

G. A. H. MILLER, G. C. SUTTON, I. H. KERR, R. V. GIBSON, M. HONEY

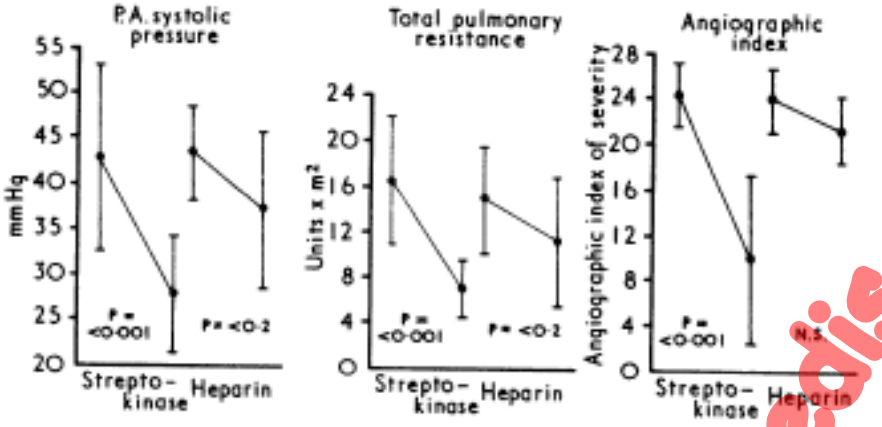


TABLE II—*Mean Values for Haemodynamic Variables and Angiographic Index of Severity before and after Treatment*

		Treatment		Probability
		Strepto-kinase	Heparin	
P.A.S.P. (mm Hg) ..	Before treatment	43·0	43·5	N.S.
	After treatment	27·8	37·2	0·02
R.P. (units × m²) ..	Before treatment	16·3	15·0	N.S.
	After treatment	7·0	11·2	<0·001
Angiographic index of severity	Before treatment	24·3	23·9	N.S.
	After treatment	9·7	21·8	<0·001
A-V O_2 (ml/100 ml) ..	Before treatment	7·3	7·5	N.S.
	After treatment	5·5	6·4	N.S.
R.V.E.D. (mm Hg) ..	Before treatment	12·1	11·6	N.S.
	After treatment	6·9	5·7	N.S.
S.A. O_2 (%)	Before treatment	84·6	81·0	N.S.
	After treatment	93·5	93·8	N.S.
CI (l./min/m²)	Before treatment	2·0	2·1	N.S.
	After treatment	2·9	2·4	N.S.

TABLE III—*Complications and Side Effects of Treatment*

		Streptokinase (15)	Heparin (8)
Bleeding: cut-down or operation sites	Slight	5	1
	Severe	3*	1
Bleeding: other sites	Slight	2	1
	Severe	0	1
Transfusion		3*	2
> 10% fall in Hb		8	1
Temperature 38-39°C		4	1
Treatment curtailed		2	0
Other		Nil	Nil

*Includes one patient with coagulation defect.

British Medical Journal, 1971, 2, 681–684

1 September 1994 Volume 121 Number 5

Annals of Internal Medicine

Risks for Major Bleeding from Thrombolytic Therapy in Patients with Acute Pulmonary Embolism

Paul D. Stein, MD; Russell D. Hull, MBBS; and Gary Raskob, MSc

Table 1. Major Bleeding i
Pulmonary Angiography

Author (reference)	tPA
Verstraete et al. (1)	5
PIOPED (2)*	4
Dalla-Volta et al. (3)	10
Goldhaber et al. (4)	10
Goldhaber et al. (5)	10

gen Activator after

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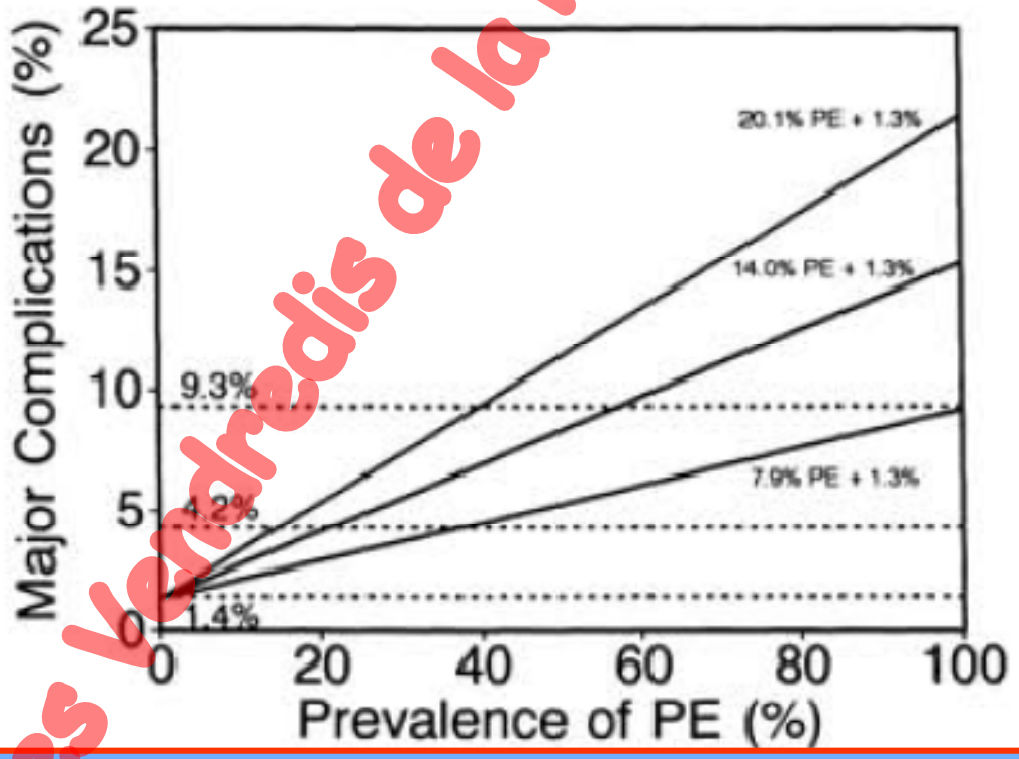
t, retroperitoneal‡
hematocrit
l; 3 patients required



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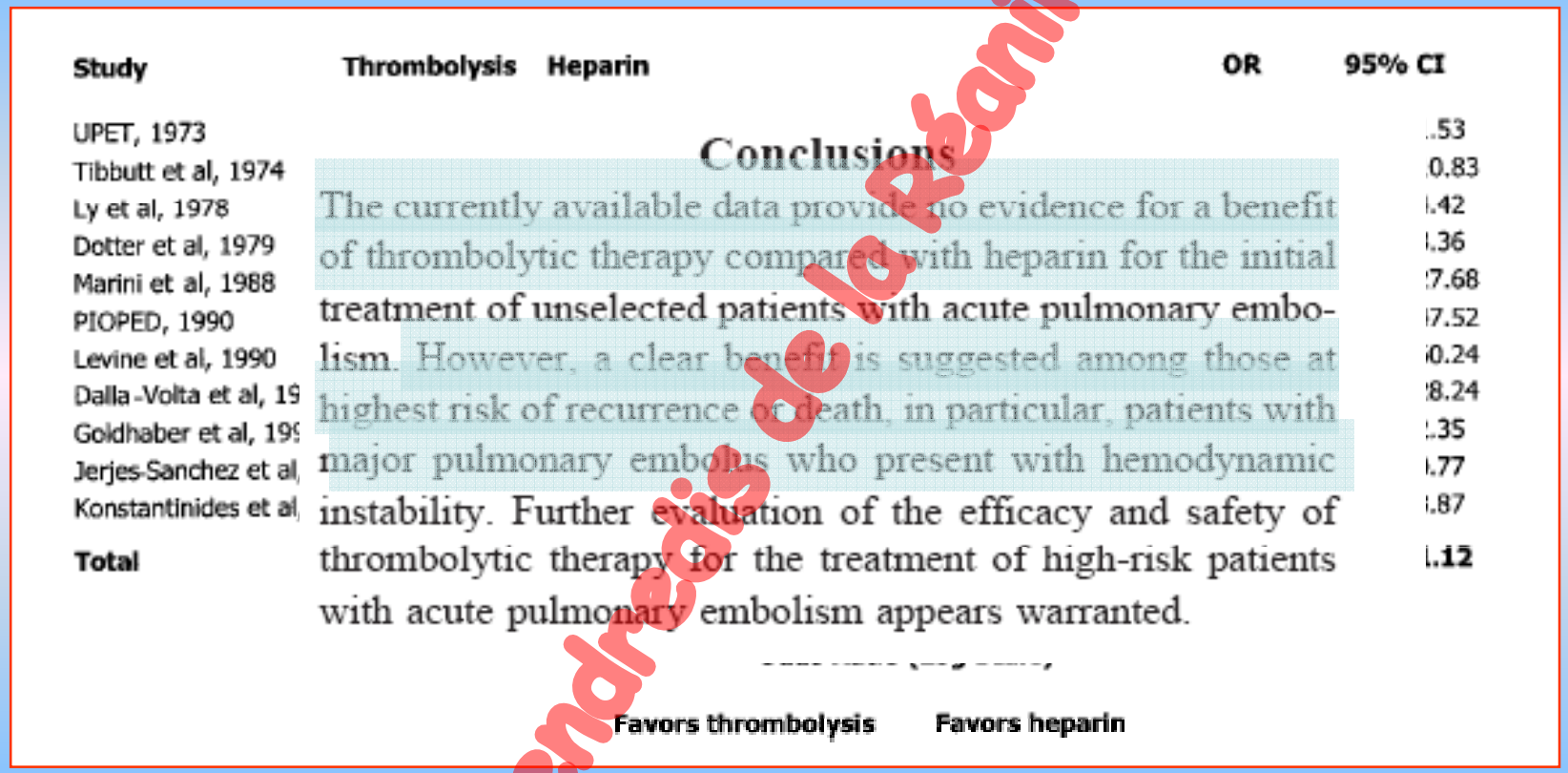
Thrombolysis Compared With Heparin for the Initial Treatment of Pulmonary Embolism

A Meta-Analysis of the Randomized Controlled Trials



Conclusions

The currently available data provide no evidence for a benefit of thrombolytic therapy compared with heparin for the initial treatment of unselected patients with acute pulmonary embolism. However, a clear benefit is suggested among those at highest risk of recurrence or death, in particular, patients with major pulmonary embolus who present with hemodynamic instability. Further evaluation of the efficacy and safety of thrombolytic therapy for the treatment of high-risk patients with acute pulmonary embolism appears warranted.

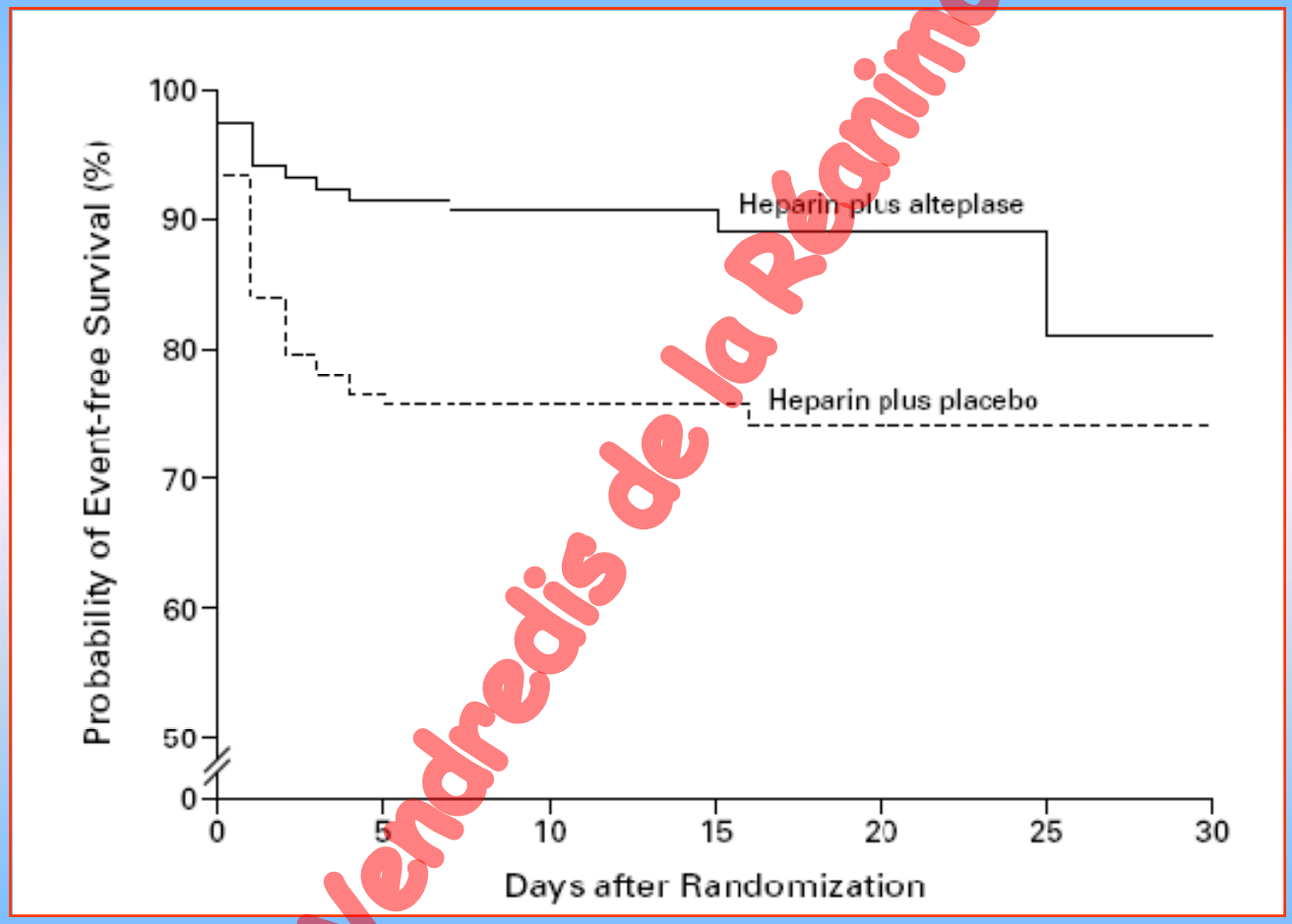
Circulation August 10, 2004

HEPARIN PLUS ALTEPLASE COMPARED WITH HEPARIN ALONE IN PATIENTS WITH SUBMASSIVE PULMONARY EMBOLISM

STAVROS KONSTANTINIDES, M.D., ANNETTE GEIBEL, M.D., GERHARD HEUSEL, PH.D., FRITZ HEINRICH, M.D., AND WOLFGANG KASPER, M.D., FOR THE MANAGEMENT STRATEGIES AND PROGNOSIS OF PULMONARY EMBOLISM-3 TRIAL INVESTIGATORS*

TABLE 2. IN-HOSPITAL CLINICAL EVENTS.*

EVENT	HEPARIN PLUS ALTEPLASE (N=118)	HEPARIN PLUS PLACEBO (N=138)	P VALUE†
	no. (%)		
Primary end point	13 (11.0)	34 (24.6)	0.006
Death from all causes	4 (3.4)	3 (2.2)	0.71
Escalation of treatment	12 (10.2)	34 (24.6)	0.004
Catecholamine infusion (for persistent hypotension or shock)	3 (2.5)	8 (5.8)	0.33
Secondary thrombolysis	9 (7.6)	32 (23.2)	0.001
Endotracheal intubation	3 (2.5)	3 (2.2)	0.85
Cardiopulmonary resuscitation	0	1 (0.7)	1.0
Embolectomy or thrombus fragmentation	0	1 (0.7)	1.0
Secondary end points			
Recurrent pulmonary embolism‡	4 (3.4)	4 (2.9)	0.89
Major bleeding§	1 (0.8)	5 (3.6)	0.29
Fatal bleeding	0	1 (0.7)	1.0
Hemorrhagic stroke¶	0	0	—
Ischemic stroke¶	0	1 (0.7)	1.0



N Engl J Med, Vol. 347, No. 15 · October 10, 2002 ·

La thrombolyse dans l'embolie pulmonaire c'est une histoire de 40 ans de travaux cliniques avec:

-Passé

-Présent

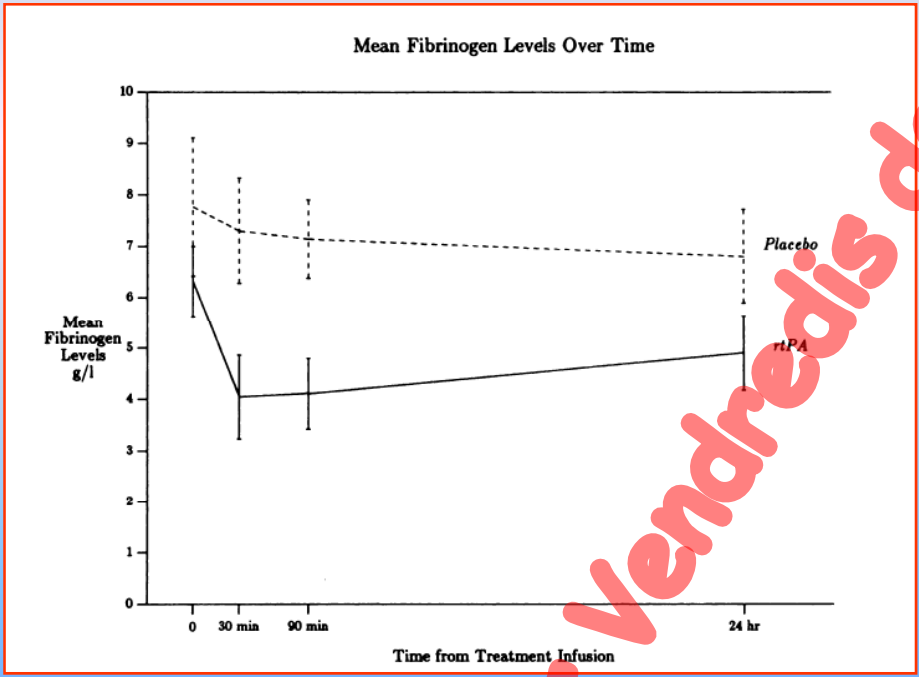
-Futur

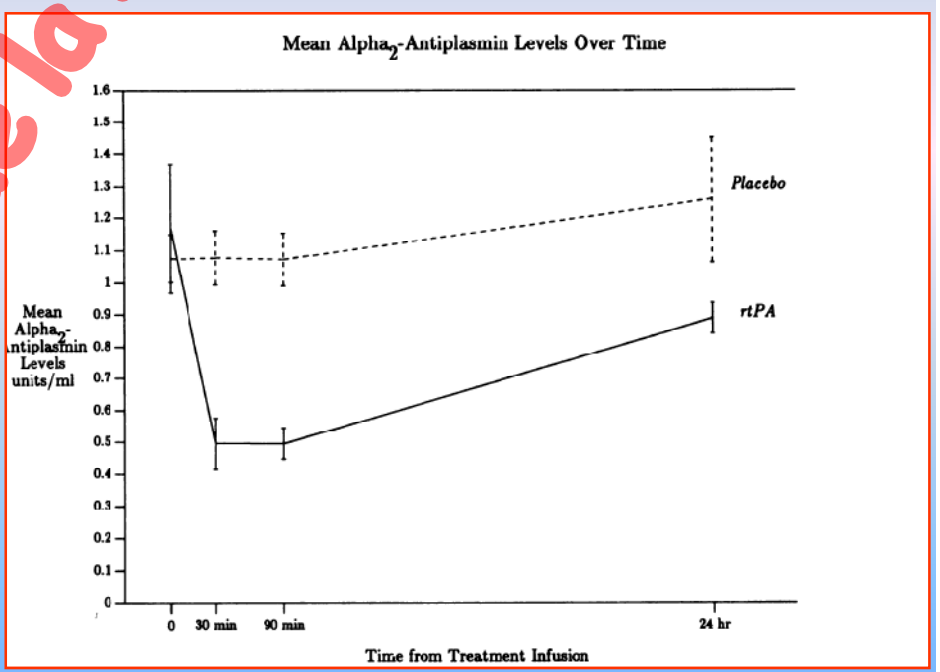
Le présent

Thrombolytic agents and regimens

A randomized trial of a single bolus dosage regimen of recombinant tissue plasminogen activator in patients with acute pulmonary embolism.

M Levine, J Hirsh, J Weitz, M Cruickshank, J Neemeh, A G Turpie and M Gent





CHEST ONLINE

A randomized trial of a single bolus dosage regimen of recombinant tissue plasminogen activator in patients with acute pulmonary embolism.

M Levine, J Hirsh, J Weitz, M Cruickshank, J Neemeh, A G Turpie and M Gent

Table 2—*Bleeding*

Type of Bleeding	Number of Patients: rt-PA	Number of Patients: Placebo
Bruising		
angiogram site*	2	0
venipuncture site†	4	0
both sites‡	3	0
Oozing		
angiogram site	1	0
venipuncture site	1	0
both sites	2	0
Serosanginous oozing		
abdominal wound	1	0
Epistaxis	1	1

Reduced Dose Bolus Alteplase vs Conventional Alteplase Infusion for Pulmonary Embolism Thrombolysis : An International Multicenter Randomized Trial

Samuel Z. Goldhaber, Giancarlo Agnelli and Mark N. Levine

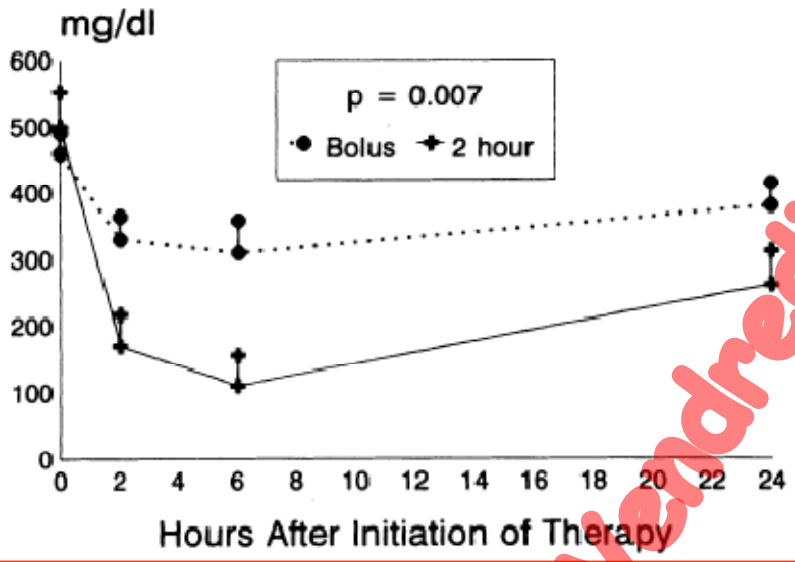


Table 2—*Adverse Events

Event	Bolus (n=60)	2 h (n=27)	p Value
Death	5†	1	0.66
Death or recurrent PE	6	2	0.99
Nonfatal ICH	0	2	0.09
Major bleeding	2	2	0.58
Other important bleeding	6	4	0.49
Death/ recurrent PE/ major or other important bleeding	10	7	0.38

CHEST / 106 / 3 / SEPTEMBER, 1994

Contents lists available at ScienceDirect

Thrombosis Research

journal homepage: www.elsevier.com/locate/thromres

Bolus tenecteplase for right ventricle dysfunction in hemodynamically stable patients with pulmonary embolism☆

Cecilia Becattini [a,*], Giancarlo Agnelli [a], Aldo Salvi [b], Stefano Grifoni [c], Leonardo Goffredo Pancaldi [d], Iolanda Enea [e], Franco Balsemin [f], Mauro Campanini [g], Angelo Ghirarduzzi [h], Franco Casazza [i] and for the TIPES Study Group [1]

Table 2
Findings at echocardiography by treatment groups.

	BASELINE			24 HOUR		
	TNK (n)	Placebo (n)	p	TNK (n)	Placebo (n)	p
Apical 4 Chamber						
RV* EDD†	49 ± 1.60 (23)	47 ± 1.71 (28)	ns	40 ± 2.16 (23)	45 ± 2.05 (28)	0.04
RV/LV EDD‡	1.36 ± 0.05 (23)	1.32 ± 0.03 (28)	ns	1.04 ± 0.07 (23)	1.22 ± 0.06 (28)	0.02

Table 3
Clinical events at 30-days.

Clinical event	Placebo (n = 30)	TNK (n = 28)
Clinical deterioration	1	-
Recurrent PE	1	1
Death	1	-
Death due to PE	-	-
Major bleeding	1	2
Minor bleeding	1	13

European Heart Journal (2008) 29, 2276–2315
doi:10.1093/eurheartj/ehn310

Guidelines on the diagnosis and management of acute pulmonary embolism

The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC)

Table 13 Approved thrombolytic regimens for pulmonary embolism

Streptokinase	250 000 IU as a loading dose over 30 min, followed by 100 000 IU/h over 12–24 h
	Accelerated regimen: 1.5 million IU over 2 h
Urokinase	4400 IU/kg as a loading dose over 10 min, followed by 4400 IU/kg/h over 12–24 h
	Accelerated regimen: 3 million IU over 2 h
rtPA	100 mg over 2 h
	or 0.6 mg/kg over 15 min (maximum dose 50 mg)

rtPA = recombinant tissue plasminogen activator.

La thrombolyse dans l'embolie pulmonaire c'est une histoire de 40 ans de travaux cliniques avec:

-Passé

-Présent

-Futur

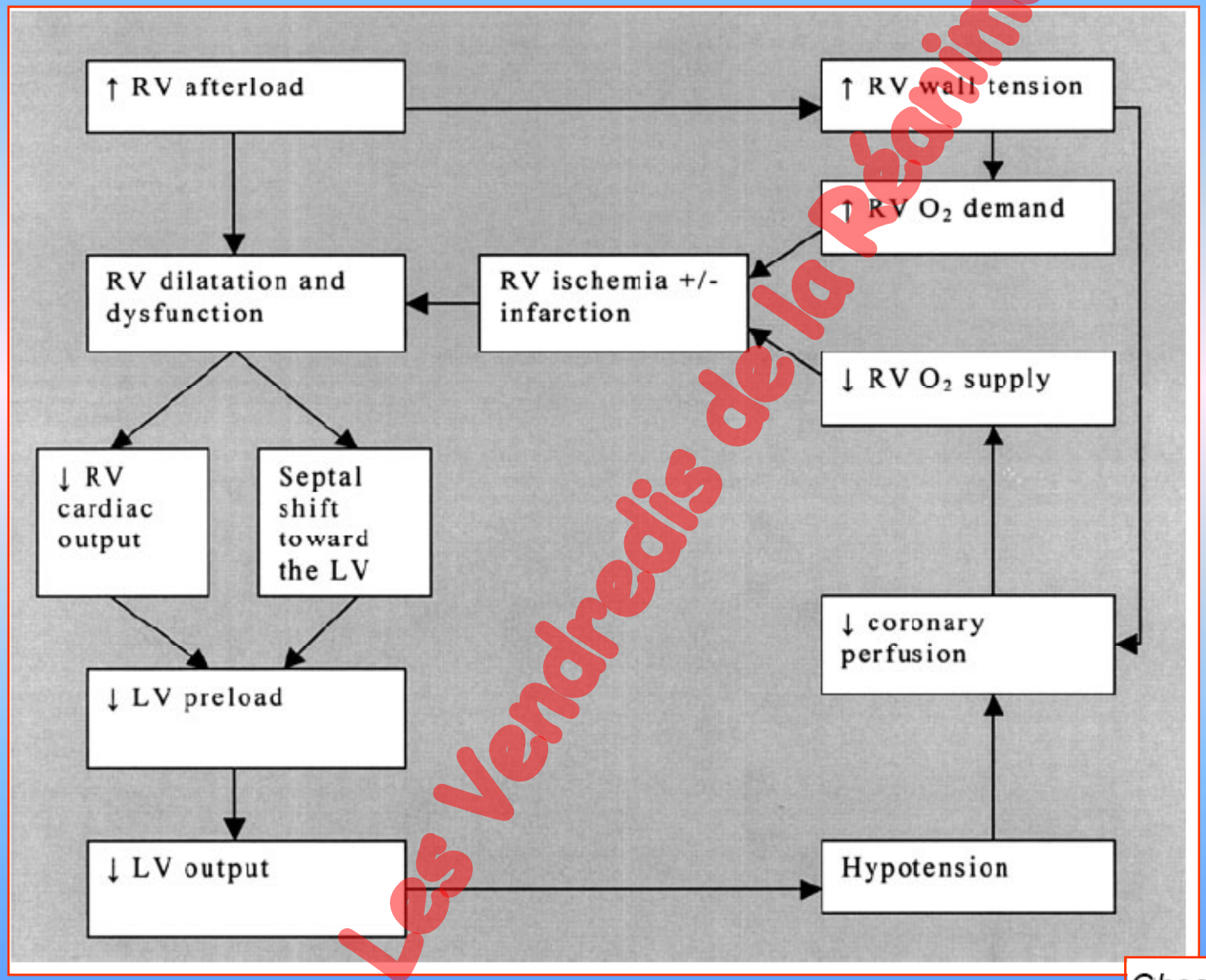
Le futur

Is intermediate-risk PE the future of thrombolysis?

The Acutely Decompensated Right Ventricle*

Pathways for Diagnosis and Management

Gregory Piazza, MD; and Samuel Z. Goldhaber, MD, FCCP



Chest 2005;128;1836-1852

The Acutely Decompensated Right Ventricle*

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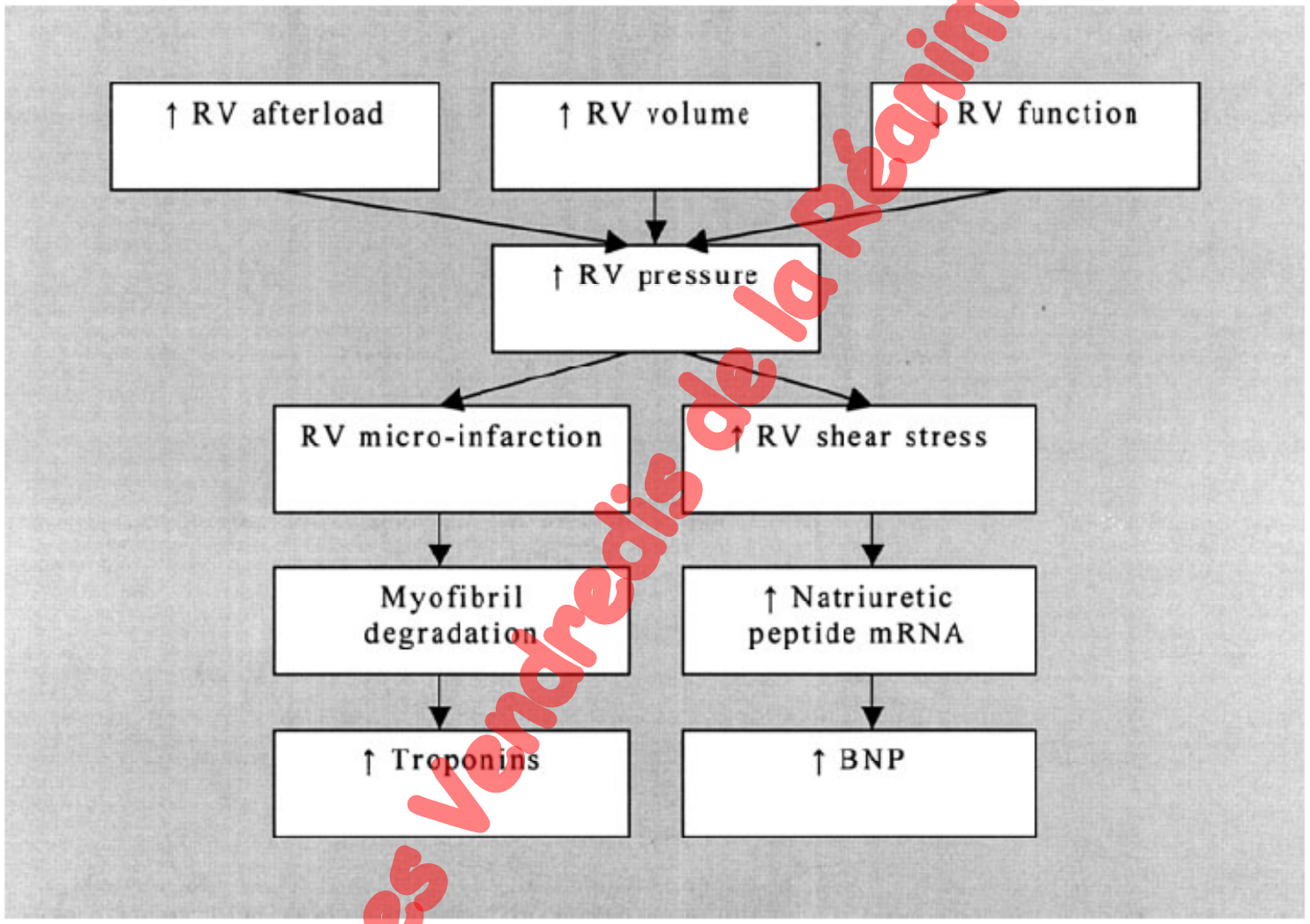

Chest 2005;128:1836-1852

European Heart Journal (2008) 29, 2276–2315
doi:10.1093/eurheartj/ehn310

Guidelines on the diagnosis and management of acute pulmonary embolism

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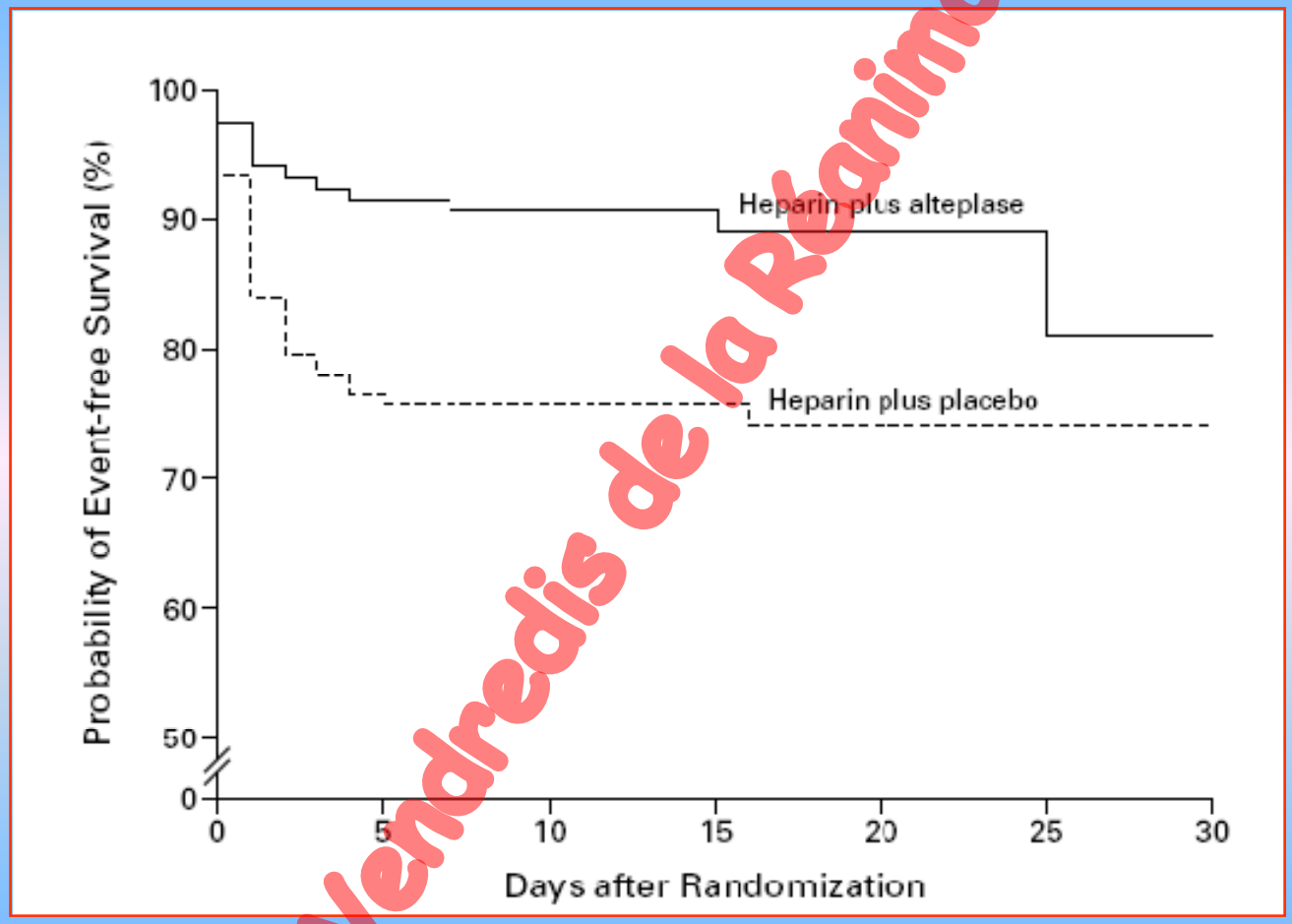
Table 9 Diagnostic value of three sets of echocardiographic signs suggesting the presence of acute PE in subgroups with and without known previous cardiorespiratory diseases

	Patients without known previous cardiorespiratory diseases ($n = 46$)			Patients with known previous cardiorespiratory diseases ($n = 54$)		
	RV overload criteria	60/60 sign	McConnell sign	RV overload criteria	60/60 sign	McConnell sign
Specificity (%)	78	100	100	21	89	100
Sensitivity (%)	81	25	19	80	26	20
PPV (%)	90	100	100	65	82	100
NPV (%)	64	37	35	36	40	40

Data are from reference 148. This article was published in the *American Journal of Cardiology*, Vol. 90, Kurzyna M, Torbicki A, Pruszczyk P, Burakowska B, Fijalkowska A, Kober J *et al.*, Disturbed right ventricular ejection pattern as a new Doppler echocardiographic sign of acute pulmonary embolism, 507–511. © Elsevier 2002.
RV overload criteria (140): the presence of ≥ 1 of four signs: (i) right-sided cardiac thrombus; (ii) RV diastolic dimension (parasternal view) >30 mm or a RV/LV ratio >1; (iii) systolic flattening of the interventricular septum; and (iv) acceleration time <90 ms or tricuspid insufficiency pressure gradient >30 mmHg in absence of RV hypertrophy.
The 60/60 sign[148] is acceleration time of RV ejection <60 ms in the presence of tricuspid insufficiency pressure gradient ≤ 60 mmHg.
The McConnell sign[147] is normokinesia and/or hyperkinesia of the apical segment of the RV free wall despite hypokinesia and/or akinesia of the remaining parts of the RV free wall. Concomitant echocardiographic signs of pressure overload are required to prevent false diagnosis of acute PE in patients with RV free wall hypo/akinesis due to RV infarction.[149]
PPV = positive predictive value; NPV = negative predictive value.

TABLE 1. BASE-LINE CHARACTERISTICS OF THE STUDY PATIENTS.*

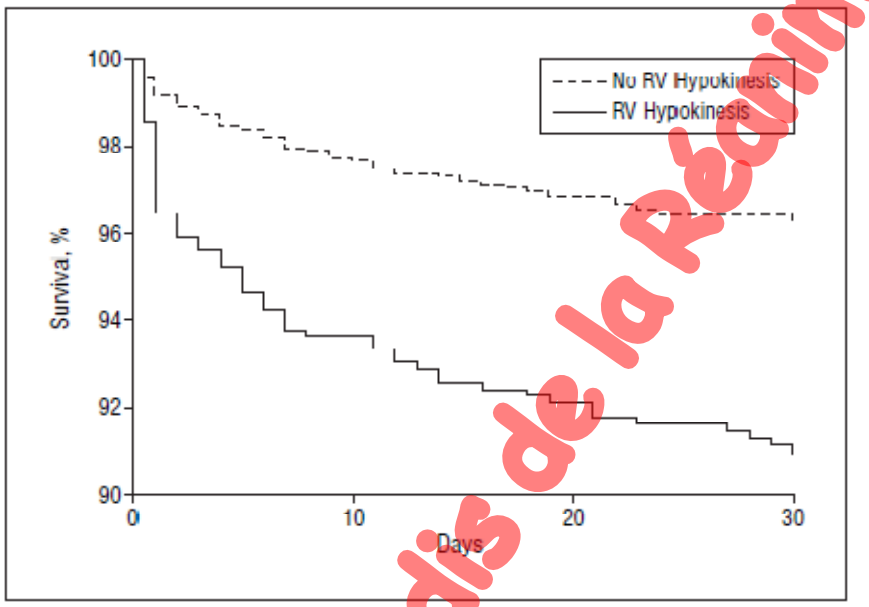
CHARACTERISTIC	HEPARIN PLUS ALTEPLASE (N=118)	HEPARIN PLUS PLACEBO (N=138)	P VALUE
Clinical			
Sex — no. (%)			0.66
Male	54 (45.8)	68 (49.3)	
Female	64 (54.2)	70 (50.7)	
Age — yr			
Men	61.2±10.1	60.5±9.7	0.70
Women	64.4±9.5	62.2±12.4	0.25
Weight — kg			
Men	86.5±16.2	86.7±16.0	0.70
Women	75.2±15.3	75.6±13.6	0.25
Previous or concomitant disease — no. (%)			
Cardiovascular	84 (71.2)	92 (66.7)	0.52
Pulmonary	40 (33.9)	51 (37.0)	0.71
Gastrointestinal or hepatobiliary	38 (32.2)	56 (40.6)	0.21
Diabetes mellitus	46 (39.0)	57 (41.3)	0.80
Renal	28 (23.7)	25 (18.1)	0.34
Musculoskeletal or dermatologic	45 (38.1)	55 (39.9)	0.88
Neurologic	9 (7.6)	12 (8.7)	0.94
Blood pressure — mm Hg			
Systolic	133±19	133±20	1.00
Diastolic	79.7±12.0	80.8±13.0	0.49
Heart rate — beats/min	103±18.9	100±17	0.18
Respiratory rate — breaths/min	23.0±6.3	22.5±6.1	0.52
Partial pressure of arterial oxygen — mm Hg	63.9±28.7	59.6±24.6	0.20
Partial pressure of arterial carbon dioxide — mm Hg	29.4±8.7	28.7±9.9	0.55
Electrocardiographic			
S waves in lead I plus Q waves in lead III — no. (%)	41 (34.7)	76 (55.1)	0.002
Complete right bundle-branch block — no. (%)	12 (10.2)	13 (9.4)	0.99
Incomplete right bundle-branch block — no. (%)	34 (28.8)	50 (36.2)	0.26
Inverted T waves in leads V_1, V_2, and V_3 — no. (%)	53 (44.9)	67 (48.6)	0.65
Echocardiographic†			
Right ventricular dysfunction — no. (%)	37 (31.4)	43 (31.2)	0.92
Laboratory			
Hematocrit — %	40.9±5.0	41.3±4.7	0.51
Platelet count — per mm³	221,000±73,600	223,000±95,900	0.87

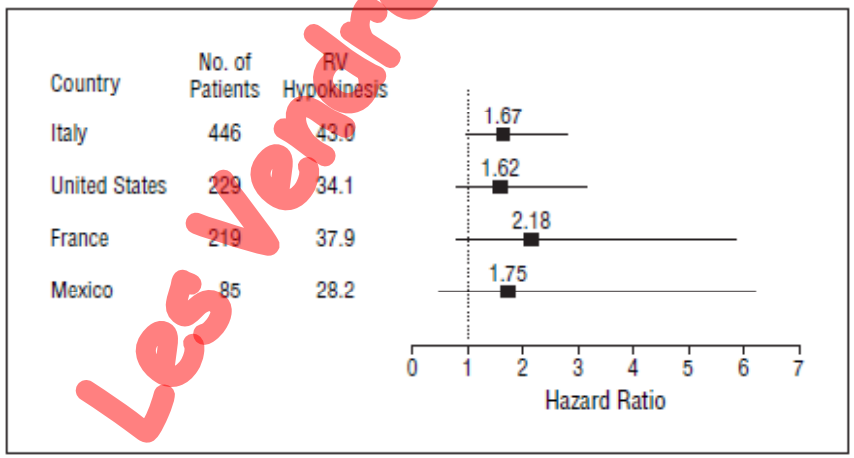


N Engl J Med, Vol. 347, No. 15 · October 10, 2002 ·

Prognostic Role of Echocardiography Among Patients With Acute Pulmonary Embolism and a Systolic Arterial Pressure of 90 mm Hg or Higher

Nils Kucher, MD; Elisa Rossi, BS; Marisa De Rosa, PhD; Samuel Z. Goldhaber, MD





Arch Intern Med. 2005;165:1777-1781

Prognostic Value of Echocardiographically Assessed Right Ventricular Dysfunction in Patients With Pulmonary Embolism

Marije ten Wolde, MD; Maaike Söhne, MD; Elske Quak, MD; Melvin R. Mac Gillavry, MD; Harry R. Büller, MD

Table 2. Clinical Characteristics of All Patients With Pulmonary Embolism

Source	No. of Patients	Mean Age, y	Hemodynamic Status	Thrombolytic Treatment, No. (%)	Patients With Confirmed PE and Available Echocardiography, No.	Patients With RVD, No. (%)	Total Mortality, No. (%)		Mortality Due to PE, No. (%)	
							Short-term*	Long-term	Short-term	Long-term
Goldhaber et al,[8] 1993	101	59	Stable	46 (46)	101	NDA	2 (2)	NDA	2 (2)	NDA
Ribeiro et al.[9] 1997	157	>65	Not reported	37 (24)	126	70 (56)	10 (8)	19 (15) (1 y)	9 (7)	9 (7)
Kasper et al,[10] 1997	317	59	Not reported	49 (15)	164	72 (44)	29 (9)	30 (9) (1 y)	13 (4)	14 (4)
Goldhaber et al,[7] 1999	2454	62	2182 Stable, 169 no symptoms	49 (15)	1135	454 (40)	280 (11)	426 (17) (3 mo)	NDA	179 (7)
Grifoni et al,[11] 2000	209	65	162 Normotensive, 19 hypotensive, 28 shock	31 (15)	207	110 (53) (Normotensive: 65 [40])	17 (8)	NDA	13 (6)	NDA
Grifoni et al,[18] 2001	117	63	Not reported	NDA	117	48 (41)	NDA	12 (10) (>6 mo)	NDA	3 (3)
Jerjes-Sanchez et al,[19] 2001	40	47	Large/massive PE, 24 normotensive	40 (100)	40	28 (70)	5 (13)	5 (13) (>1 y)	4 (10)	NDA

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Prognostic Value of Echocardiographically Assessed Right Ventricular Dysfunction in Patients With Pulmonary Embolism

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Table 3. Mortality in Pati

Source	PE, No. (%)			
			Long-term	
			RVD Present	RVD Absent
Goldhaber et al,[8] 1993			NDA	NDA
Ribeiro et al,[9] 1997			9 (13)	0
Kasper et al,[10] 1997			11 (13)	3 (1)
Goldhaber et al,[7] 1999			NDA	NDA
Grifoni et al,[11] 2000			NDA	NDA
Grifoni et al,[18] 2001			3 (3)	0
Jerjes-Sanchez et al,[19] 2001			NDA	NDA

In conclusion, the prognostic importance of right ventricular dysfunction in patients with acute PE remains unclear because most of the available studies are of insufficient methodologic quality. They suggest that right ventricular dysfunction predicts adverse outcomes; however, this predictive potential seems less strong in hemodynamically stable patients with acute PE. It needs to be convincingly shown that the risk of aggressive therapy outweighs the potentially small gain in absolute benefit, as measured by PE-related mortality.

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Table 11 Major trials reporting definitions and prognostic significance of RV dysfunction assessed by echocardiography in acute pulmonary embolism

Author	n	Patient characteristics	Echocardiographic criteria	Early mortality RVD(+) vs. RVD(−)
Goldhaber *et al.*[175]	101	Normotensive	RV hypokinesis and dilatation	4.3 vs. 0%
Ribeiro *et al.*[141]	126	Normotensive and hypotensive	RVD	12.8 vs. 0%
Kasper *et al.*[142]	317	Normotensive and hypotensive	RV >30 mm or TI >2.8 m/s	13 vs. 0.9%
Grifoni *et al.*[140]	162	BP ≥100 mmHg	At least one of the following: RV >30 mm or RV/LV >1 Paradox septal systolic motion AcT <90 ms or TIPG >30 mmHg	4.6 vs. 0%
Kucher *et al.*[176]	1035	BP ≥90 mmHg	RVD	16.3 vs. 9.4%[a]

All data refer to in-hospital PE-related mortality, except [a]30 day all-cause mortality.
RVD(+) = patients with RV dysfunction; RVD(−) = patients with normal RV function.
RV = right ventricle; BP = blood pressure; TI = tricuspid insufficiency; LV = left ventricle; AcT = acceleration time of right ventricular ejection; TIPG = tricuspid insufficiency peak gradient.

The Acutely Decompensated Right Ventricle*

Pathways for Diagnosis and Management

Gregory Piazza, MD; and Samuel Z. Goldhaber, MD, FCCP

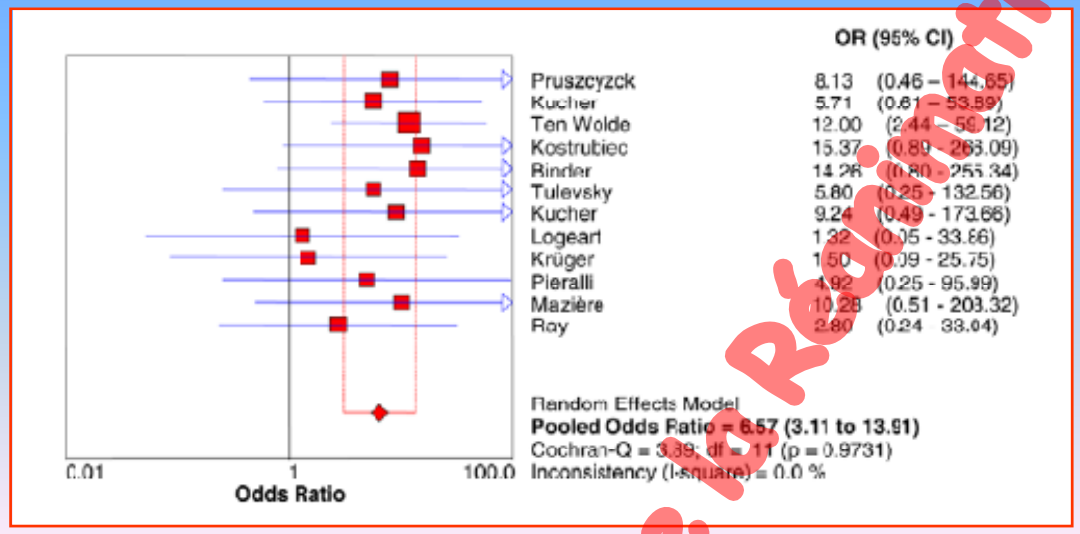
Table 5—*Accuracy of Cardiac Biomarkers for the Prediction of In-Hospital Death in Acute PE

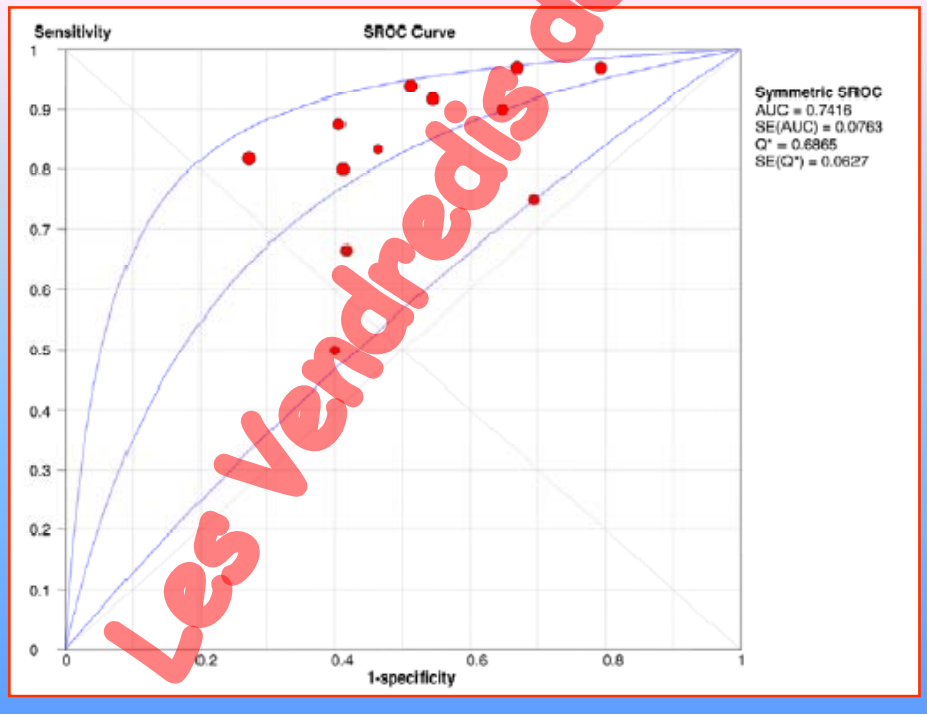
Study	Patients, No.	Biomarker	Assay	Cutoff Level	Positive Test Result	Sens	Spec	NPV	PPV
Konstantinides et al[23]	106	cTnI	Centaur (Bayer†)	0.07 ng/mL	41	86	62	98	14
Konstantinides et al[23]	106	cTnT	Elecsys (Roche§)	0.04 ng/mL	37	71	66	97	12
Giannitsis et al[24]	56	cTnT	TropT (Roche)	0.10 ng/mL	32	88	78	97	44
Janata et al[25]	106	cTnT	Elecsys (Roche)	0.09 ng/mL	11	80	92	99	34
Pruszczyk et al[27]	64	cTnT	Elecsys (Roche)	0.01 ng/mL	50	100	57	100	25
ten Wolde et al[31]	110	BNP	Shionoria (CIS Bio‖)	21.7 pmol/L	33	86	71	99	17
Kucher et al[30]	73	Pro-BNP	Elecsys (Roche)	500 pg/mL	58	95	57	100	12
Kucher et al[29]	73	BNP	Triage (Biosite¶)	50 pg/mL	58	95	60	100	12
Pruszczyk et al[26]	79	Pro-BNP	Elecsys (Roche)	153–334 pg/mL†	66	100	33	100	23

Chest 2005;128;1836-1852

Prognostic value of brain natriuretic peptide in acute pulmonary embolism

Guillaume Coutance[1], Olivier Le Page[2], Ted Lo[1] and Martial Hamon[1,3]





Critical Care 2008, **12**:R109

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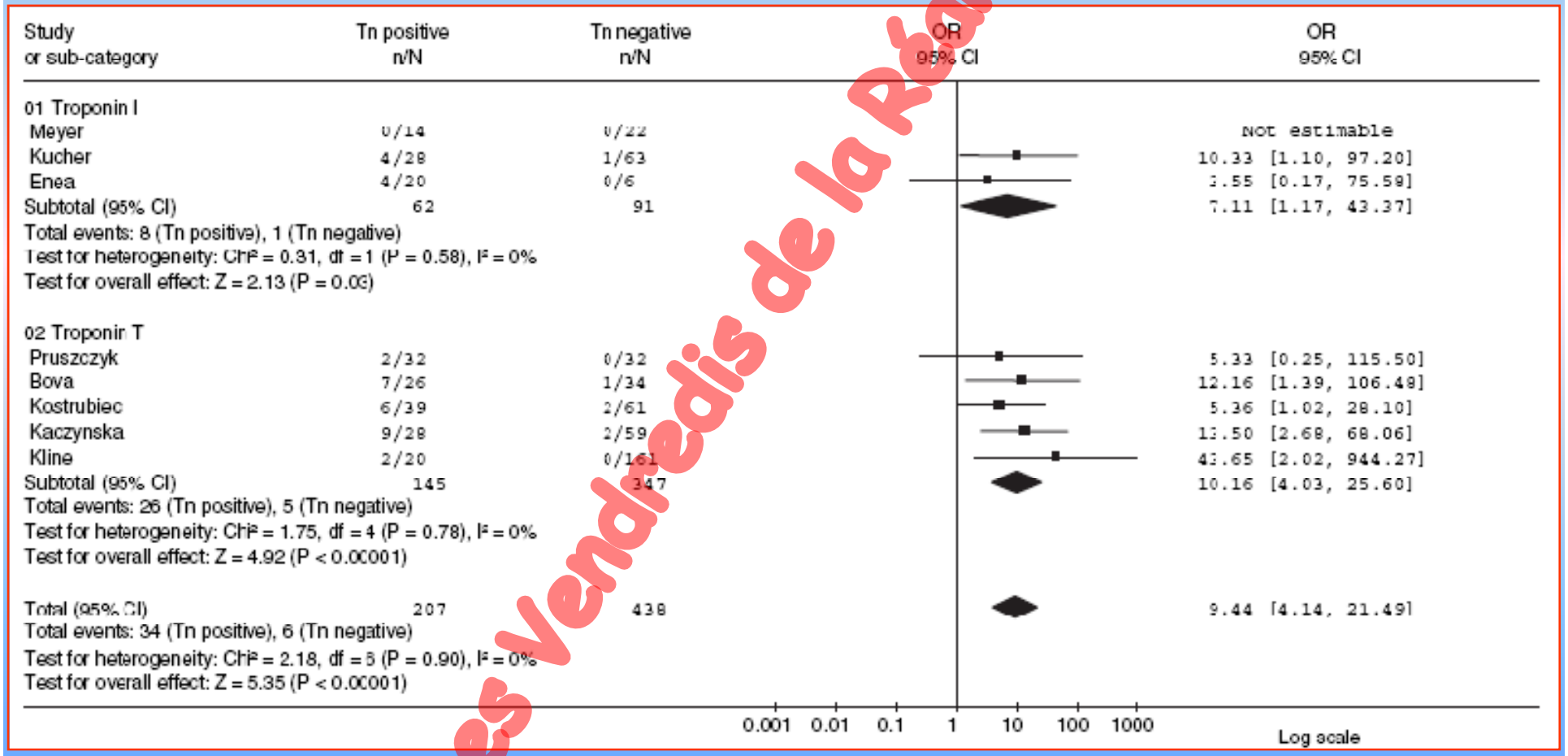
Prognostic Value of Troponins in Acute Pulmonary Embolism: A Meta-Analysis

Cecilia Becattini, Maria Cristina Vedovati and Giancarlo Agnelli



European Heart Journal (2008) 29, 1569–1577
doi:10.1093/eurheartj/ehn208

CLINICAL RESEARCH
Pulmonary hypertension

Prognostic value of right ventricular dysfunction in patients with haemodynamically stable pulmonary embolism: a systematic review

Olivier Sanchez[1,2]*, Ludovic Trinquart[3,4], Isabelle Colombet[2,5,6], Pierre Durieux[2,5,6], Menno V. Huisman[8], Gilles Chatellier[2,5,6], and Guy Meyer[1,2,7]

Table 2 Pooled diagnostic indexes for echocardiography, computed tomography, brain natriuretic peptide (BNP), pro-BNP, and cardiac troponin

	Test				
	Echocardiography	Computed tomography	BNP	Pro-BNP	Cardiac troponin
Sensitivity (%) (95% CI)	70 (46–86)	66 (35–85)	88 (65–96)	93 (14–100)	81 (23–100)
Specificity (%) (95% CI)	57 (47–66)	56 (39–71)	70 (64–75)	58 (14–92)	84 (77–90)
Negative predictive value (%) (95% CI)	60 (55–65)	58 (51–65)	76 (73–79)	81 (65–97)	73 (68–78)
Positive predictive value (%) (95% CI)	58 (53–63)	57 (49–64)	67 (64–70)	63 (50–76)	75 (69–80)

95% CI, 95% confidence interval.

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CLINICAL RESEARCH
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Conclusion

This systematic review suggests that elevated cardiac biomarkers and RV dysfunction, demonstrated by echocardiography or spiral CT, are associated with increased risk of mortality in patients with non-massive PE. These findings should be interpreted with caution because of the clinical and methodological diversity of studies. Well-designed prospective studies, with pre-specified definitions of RV dysfunction assessed by echocardiography and spiral CT as well as plasma-levels of cardiac biomarkers, are required to tackle this research question specifically. Limitations of available studies preclude the use of these markers for selecting the appropriate candidates to thrombolytic therapy among clinically stable patients with PE.

N-Terminal Pro–Brain Natriuretic Peptide or Troponin Testing Followed by Echocardiography for Risk Stratification of Acute Pulmonary Embolism

Lutz Binder, MD; Burkert Pieske, MD; Manfred Olschewski, PhD; Annette Geibel, MD; Beate Klostermann, MD; Christian Reiner, MD; Stavros Konstantinides, MD

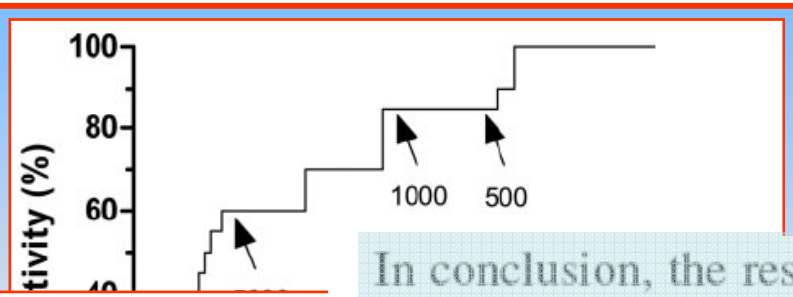

TABLE 3. Combination o
Echocardiography for Def

Event		
NT-proBNP combined with ech		
Group 1: NT-proBNP <1000		
Group 2: NT-proBNP >1000		
Group 3: Echo positive*†		
Cardiac troponin T combined w		
Group 1: TnT negative,‡ ech		
Group 2: TnT positive,‡ ech		
Group 3: TnT negative,‡ echo positive*	5.56 (0.97–31.99)	0.055
Group 4: TnT positive,‡ echo positive*	10.00 (2.14–46.80)	0.004

In conclusion, the results of the present study demonstrate that NT-proBNP or troponin testing combined with echocardiography may reliably identify both low-risk and high-risk patients with PE. Apart from proposing a simple risk stratification algorithm for use in clinical practice, these findings could provide the background for larger triage studies integrating NT-proBNP or troponins into the management of acute PE and, more specifically, testing the possible benefits of early thrombolysis in the high-risk patient group.

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Table 14 Contraindications to fibrinolytic therapy

Absolute contraindications[a]

- Haemorrhagic stroke or stroke of unknown origin at any time
- Ischaemic stroke in preceding 6 months
- Central nervous system damage or neoplasms
- Recent major trauma/surgery/head injury (within preceding 3 weeks)
- Gastrointestinal bleeding within the last month
- Known bleeding

Relative contraindications

- Transient ischaemic attack in preceding 6 months
- Oral anticoagulant therapy
- Pregnancy or within 1 week post partum
- Non compressible punctures
- Traumatic resuscitation
- Refractory hypertension (systolic blood pressure >180 mmHg)
- Advanced liver disease
- Infective endocarditis
- Active peptic ulcer

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Intermediate-risk pulmonary embolism defines patients who appear haemodynamically stable on admission but have evidence of RVD and/or myocardial injury. A recent trial randomized 256 patients

thrombolysis (*Table 14*) to heparin vs. rtPA treatment.[207] The primary combined endpoint, in-hospital death or clinical deterioration requiring escalation of treatment, was significantly reduced in the thrombolysis group compared with the heparin group. The difference was due to a more frequent need for secondary (emergency) thrombolysis in the heparin group during the hospital stay, while the overall mortality rate was not affected by thrombo-

lysis. Thus, it appears that the risk/benefit ratio of thrombolysis may be favourable in selected patients with intermediate-risk PE, particularly in those without an elevated risk of bleeding

and will attempt to resolve the controversy still surrounding the appropriate treatment of this patient group.

16 patients avec une embolie pulmonaire confirmée par un angioscanner thoracique, stables sur le plan hémodynamique et avec un CPA à l'ETT ont été thrombolysés

Table 3. Echocardiographic parameters before and 24 hours after thrombolysis

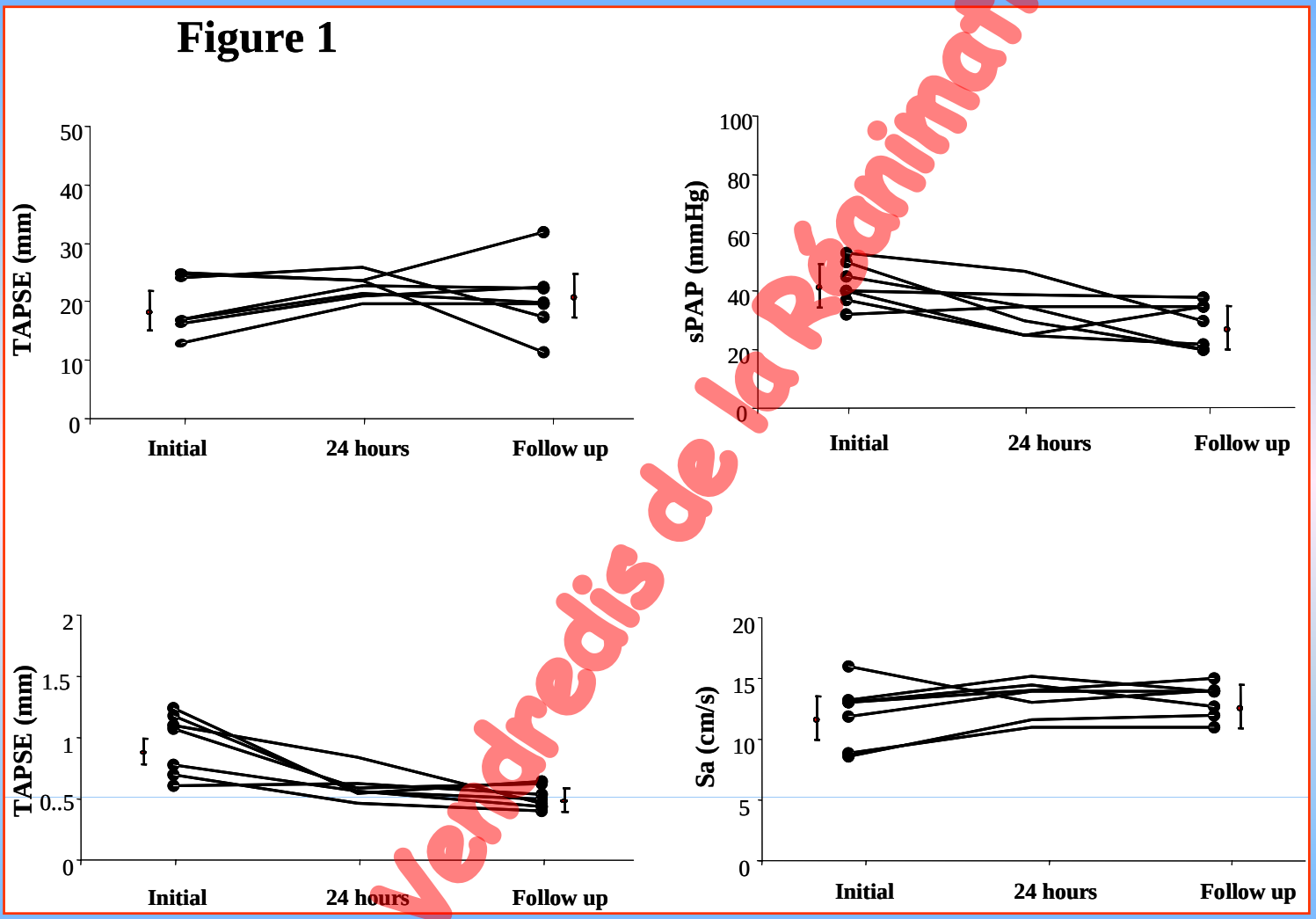
Echocardiographic parameters	Before	After	
RVEDA/LVEDA	1.1 ± 0.3	0.8 ± 0.3	0.002
sPAP (mmHg)	52 ± 14	41 ± 13	< 0.0001
TAPSE (mm)	17 ± 4	21 ± 3	0.001
Sa (cm/s)	12.1 ± 4	13.6 ± 3	0.1
VTI (cm)	16 ± 3	16.4 3	0.6
LVEF (%)	57 ± 7	59 ± 8	0.1
Pardoxical septal systolic motion (n)	16	3	

Table 4: Evolution of the 16 patients

Patients	LOS (days)	MV (Length; days)	Bleeding complications	Death (Cause)
1	15	0	0	0
2	5	0	0	0
3	7	0	0	1 (secdondary cardiogenic schock)
4	2	0	0	0
5	69	1 (60)	0	1 (refractory septic shock)
6	1	1 (0.8)	0	0
7	5	0	0	0
8	48	1 (42)	1 (psoas hematoma)	1 (refractory septic shock)
9	5	1 (5)	0	0
10	9	0	0	0
11	7	0	0	0
12	6	1 (3)	0	1 (refractory septic shock)
13	14	0	0	0
14	13	0	0	0
15	7	0	0	0
16	6	1 (3)	0	1 (secondary cardiogenic shock)

MV: mechanical ventilation; LOS: length of stay

Figure 1



Conclusion

Les experts et la conférence de consensus la plus récente recommandent la thrombolyse chez les patients à haut risque de mortalité (état de choc) alors que l'héparine est recommandée chez les patients non à haut risque qui sont normotendues.

rt-PA 100 mg en 2heures est le traitement de choix mais les autres médicaments thrombolytiques sont aussi efficaces

Les bolus de Reteplase ou Tenecteplase s'avèrent comme une alternative pratique

Cependant en dehors du faible nombre que représente la population « haut risque », la poulation avec un risque intermédiaire représente la cible actuelle de la thrombolyse

Une prise de conscience de l'importance de la stratification du risque en se basant sur les paramètres échographiques et les bio-marqueurs.

Merci pour vôtre attention