

Impact of Thrombectomy with EXPort catheter in Infarct Related Artery during Primary PCI on Procedural Outcome in patients with AMI (EXPIRA Trial). 24 Months Clinical Outcome

Gennaro Sardella, Massimo Mancone, Emanuele Canali, Rocco Stio, Luigi Lucisano, Angelo Di Roma, Giulia Benedetti, Luciano Agati, Francesco Fedele

GENNARO SARDELLA, MD, FACC, FESC

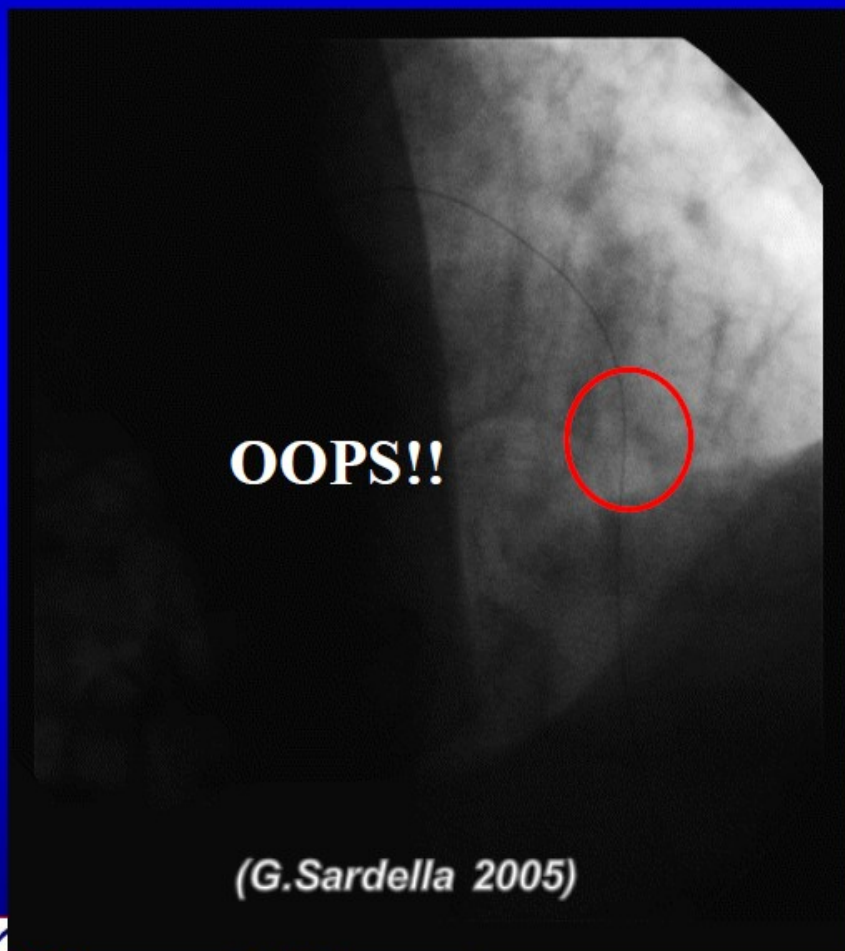
*O.U. of Invasive Cardiology, Dept. of Cardiovascular Sciences
Policlinico Umberto I
"Sapienza" University of ROME*



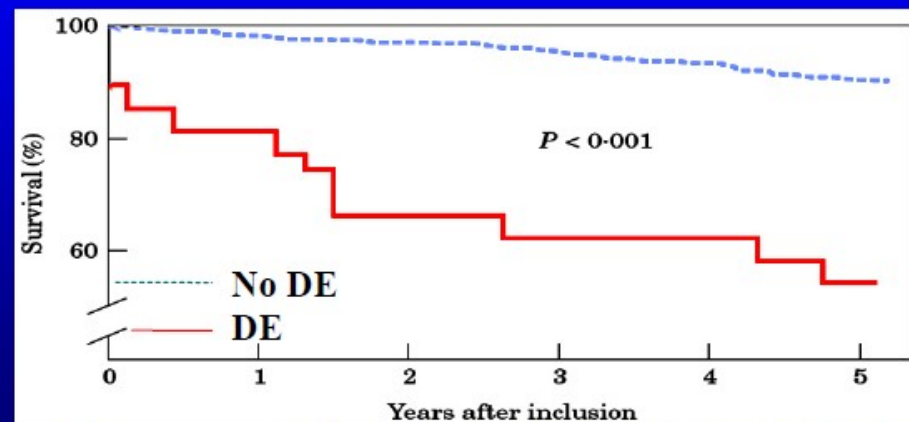


Distal embolization during Primary PCI

- In STEMI the “no-flow” phenomenon is caused by the **distal embolization** after the IRA reopening.



	No DE n = 167 (86.1%)	DE n = 27 (13.9%)	P Value
Patency	151 (92)	19 (73)	0.009
LVEF (%)	51 ± 9	42 ± 14	0.005
LDH (Q72)	847 ± 631	1612 ± 1008	0.001
Mortality	15 (9)	12 (44)	< 0.001
Death/re- MI	23.9	21.5	0.48



(Henriques JPS et al Eur H J 2002:23-1112-17)



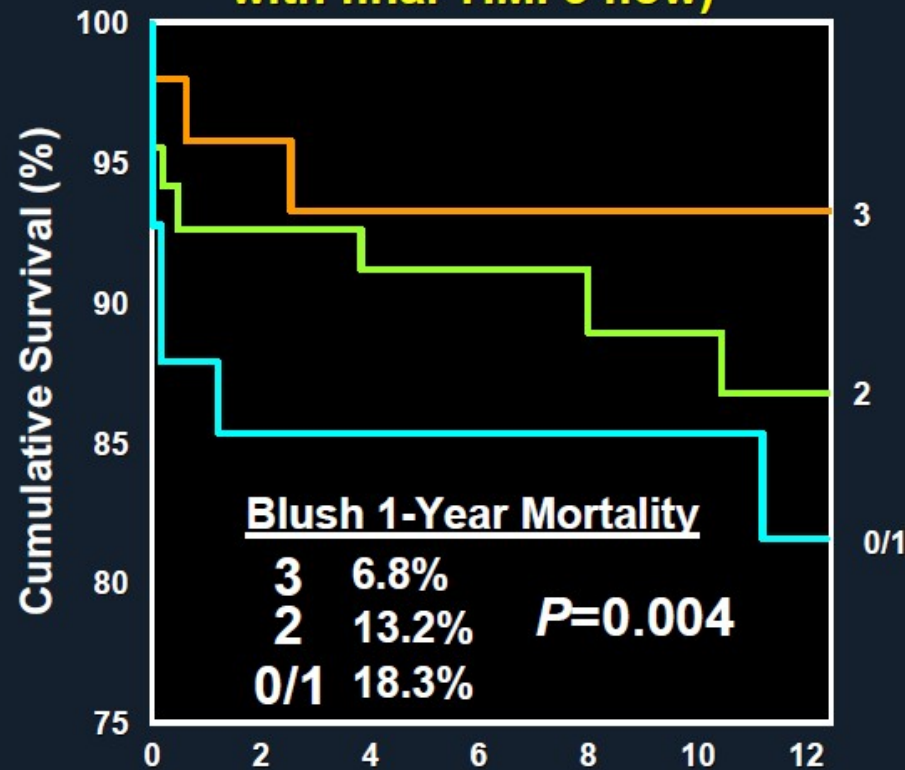


Background

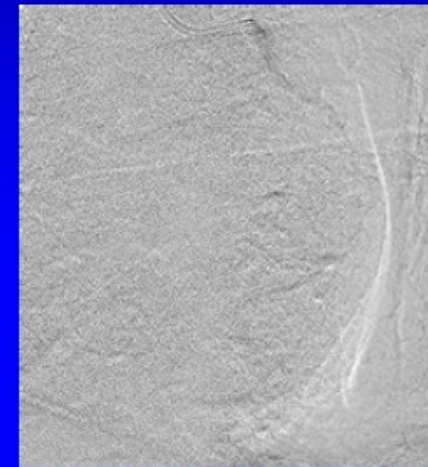
Myocardial Perfusion After Primary PCI is the Strongest Predictor of Mortality independently from IRA reopening

PPCI Hardest Goal

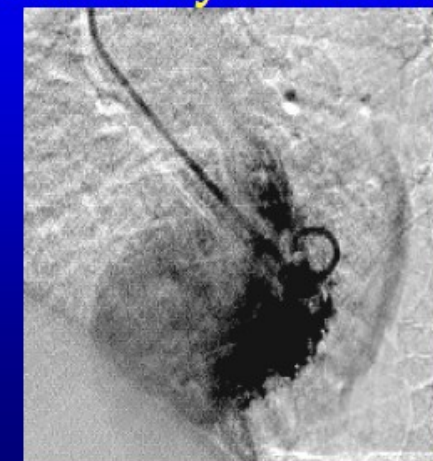
Final Blush Score (patients with final TIMI 3 flow)



Stone GW, et al. *J Am Coll Cardiol.* 2002;39:591-597.



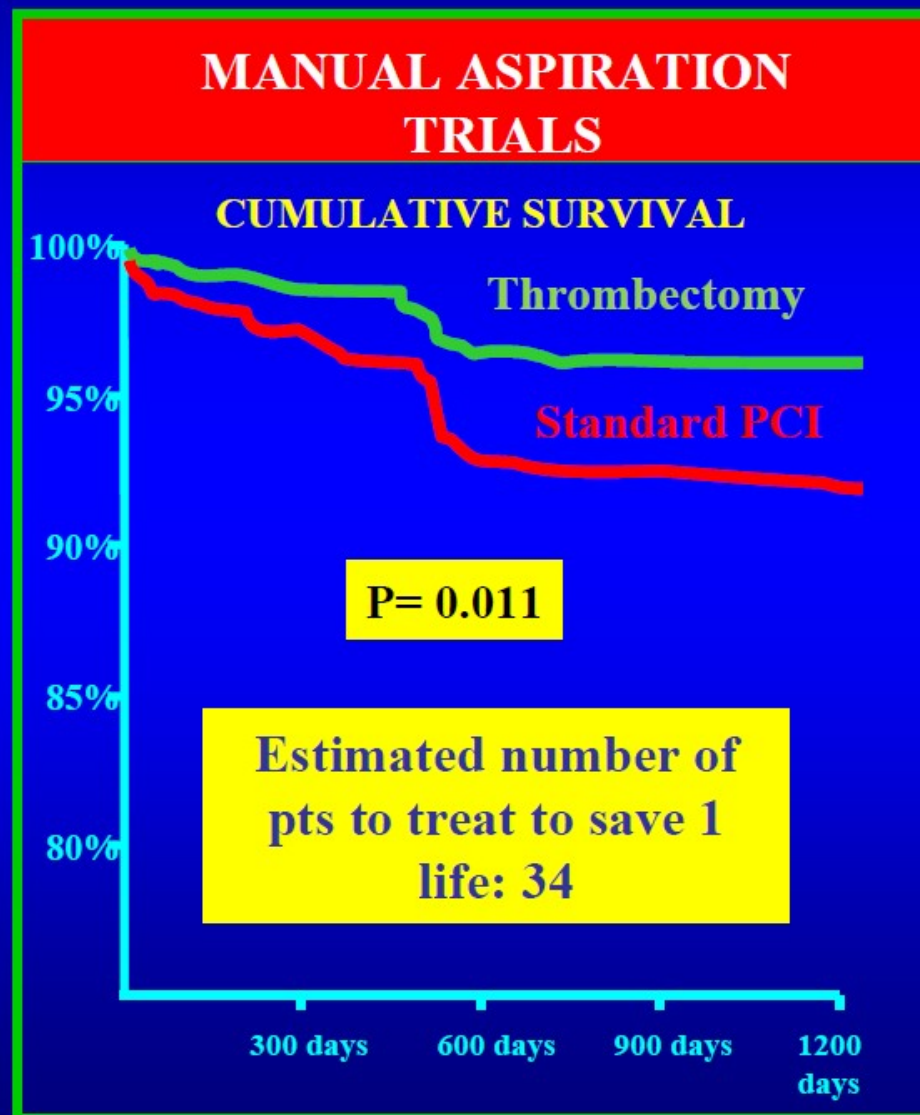
" Open Artery ...but Closed Myocardium "!!





A comprehensive meta-analysis 11 Randomized Clinical Trial N= 2686 pts

Study	Design	Thrombectomy device	Timing of randomization
Antoniucci et al. ¹⁸	Single centre	Non-manual T (Angiojet)	After coronary angiography
REMEDIA ²⁰	Single centre	Manual T (Diver CE)	Before coronary angiography
X-AMINE ST ²¹	Multicentre	Non-manual T	After coronary
Noel et al. ³¹	Single centre	Manual T (Export)	After coronary angiography
DEAR-MI ²²	Single centre	Manual T (Pronto)	Before coronary angiography
VAMPIRE ²⁸	Multicentre	Non-manual T (TVAC)	Before coronary angiography
De Luca et al. ²⁴	Single centre	Manual T (Diver CE)	After coronary angiography
PIHRATE ³²	Multicentre	Manual T (Diver CE)	After coronary angiography
EXPIRA ³⁰	Single centre	Manual T (export)	After coronary angiography
TAPAS trial ²⁷	Single centre	Manual T (Export)	Before coronary angiography



Impact of Thrombectomy with **EX**Port catheter in **I**nfarct **R**elated **A**rtery on procedural and clinical outcome in patients with AMI (**EXPIRA** Trial).

(G.Sardella TCT LBCT 2007)

Design

- Prospective, randomized, double-arm, mono-centric study.
- Primary end-point :
 - **Final MBG ≥ 2 ;**
 - **90' ST resolution**
 (> 70% decrease of ST segment after PCI)

Secondary end-point :

- **MACE 9 -24 months clinical f-u**

G.Sardella et al

J. Am. Coll. Cardiol 2009;53;309-315

256 pts.
(STEMI, at 6.8 ± 2.3 h from symptoms onset)

(Heparin 7.500 U/I, GPIIb/IIIa, Aspirin, Clopidogrel 300 mg)

175 pts. eligible for 1:1 randomization

81 pts.excluded:

- Cardiogenic shock
- 3-vessel / Left Main
- TIMI >0-1
- TS < 3
- Contra to GPIIb/IIIa

88 pts
randomized to
Thrombectomy + PCI

87 pts
randomized to
Standard PCI

Final MBG ≥ 2 ; 90' ST resolution

9-24 months clinical f-u





Randomization after Angiography

Inclusion Criteria

- Age >18 yrs
- STEMI within 6-9 hrs from symptoms onset
- “*De novo*” coronary artery lesions
- Native IRA ≥ 2.5 mm diameter
- Angiographically identifiable occlusive thrombus (TS grade ≥ 3)
- TIMI 0-1 at time of initial angiography

Exclusion Criteria

- Previous AMI or CABG
- Cardiogenic shock
- 3-vessel / Left Main CAD
- Severe valvular heart disease
- Unsuccessful PCI (*no antegrade flow or 50% residual stenosis in the IRA*)
- Rescue / Facilitated PCI
- Contraindication to GP IIb/IIIa inhibitors

(G.Sardella et al J. Am. Coll. Cardiol 2009;53;309-315)



Impact of Thrombectomy with **EX**Port catheter in **I**nfarct **R**elated **A**rtery during Primary PCI on Procedural Outcome in patients with AMI (**EXPIRA** Trial).

Baseline clinical characteristics

	Total (n = 175)	S-PCI (n = 87)	EM-PCI (n = 88)	p Value
Age, yrs	65.3 ± 11.2	64.6 ± 12.5	66.7 ± 14.1	0.298
Males (%)	105 (60.0)	48 (55.1)	57 (64.7)	0.218
Risk factors				
Hypertension (%)	102 (58.3)	43 (49.4)	59 (67.0)	0.021
Diabetes (%)	37 (21.1)	16 (18.4)	21 (23.8)	0.459
Smoking (%)	66 (37.7)	23 (26.4)	43 (48.8)	0.003
Obesity (%)	7 (4.0)	2 (2.3)	5 (5.7)	0.443
Family history of CAD (%)	58 (33.1)	32 (36.8)	26 (29.5)	0.338
Cholesterol, mg/dl ± SD	163 ± 27	167 ± 15	161 ± 11	0.002
Triglycerides, mg/dl ± SD	122 ± 37	125 ± 26	124 ± 31	0.817
Renal failure (%)	14 (8.0)	7 (8.0)	7 (7.9)	1.00
Killip class III (%)	42 (24.0)	25 (28.7)	17 (19.3)	0.160
Symptoms to balloon, h ± SD	6.1 ± 1.3	6.1 ± 1.8	6.2 ± 0.9	0.642
LVEF, % ± SD	41 ± 13	40.7 ± 9.3	42 ± 10.5	0.192
ST-segment elevation, mV	22.9 ± 13.5	22.3 ± 9.3	23.6 ± 10.5	0.384





Impact of Thrombectomy with **EXPort** catheter in **Infarct Related Artery** during Primary PCI on Procedural Outcome in patients with AMI (**EXPIRA Trial**). **24 Months Clinical Outcome**

Baseline procedural and angiographic characteristics

	Total (n = 175)	S-PCI (n = 87)	EM-PCI (n = 88)	p Value
Left anterior descending artery	76 (43.4)	38 (43.7)	38 (43.2)	1.00
Left circumflex artery	42 (24.0)	20 (23.0)	22 (25.0)	0.859
Right coronary artery	57 (32.6)	29 (33.3)	28 (31.8)	0.872
BARI score, %	28.9 ± 10.3	28.1 ± 9.2	29.7 ± 6.1	0.17
Multivessel disease (%)	37 (26.8)	16 (18.4)	21 (23.8)	0.459
Bifurcation (%)	23 (13.1)	11 (12.7)	12 (13.6)	1.00
Pre-thrombectomy thrombus score (%)				
3	18 (10.3)	9 (10.3)	9 (10.6)	1.00
4	62 (35.4)	32 (36.8)	30 (34.1)	0.753
5	95 (54.3)	47 (54.0)	48 (54.5)	1.00
“Direct” stenting	69 (39.4)	2 (2.3)	67 (76.2)	0.0001
Drug-eluting stent	102 (58.3)	53 (60.9)	49 (55.7)	0.540

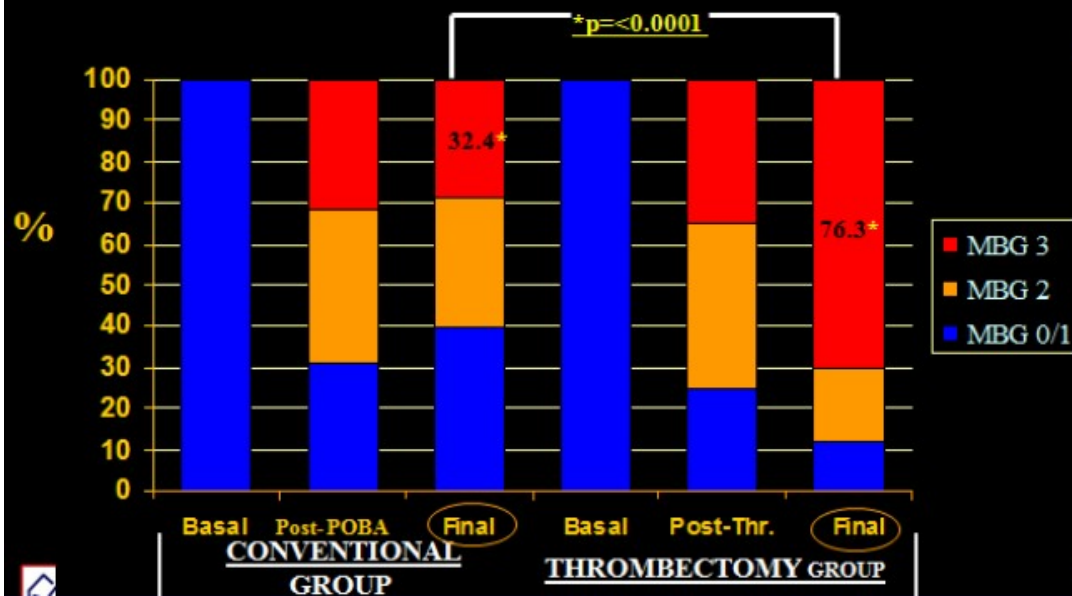




Impact of Thrombectomy with **EX**Port catheter in **I**nfarct **R**elated **A**rtery on procedural and clinical outcome in patients with AMI (**EXPIRA** Trial).

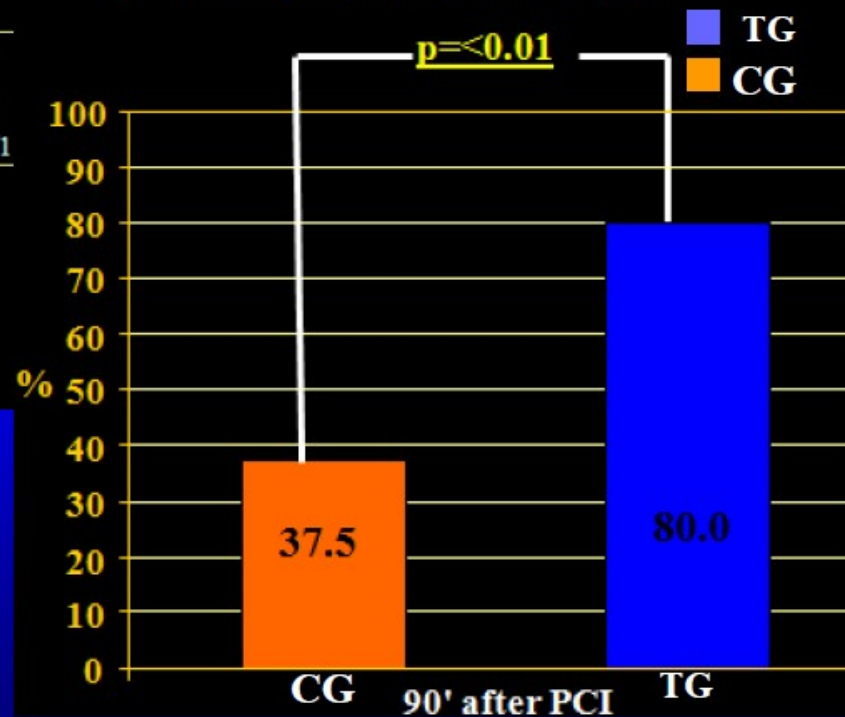
Primary End-points

MYOCARDIAL BLUSH GRADE



ST resolution after PCI, %

(> 70% decrease of ST segment)



Impact of Thrombectomy with EXPort catheter in Infarct Related Artery on procedural and clinical outcome in patients with AMI (EXPIRA Trial). MRI Substudy

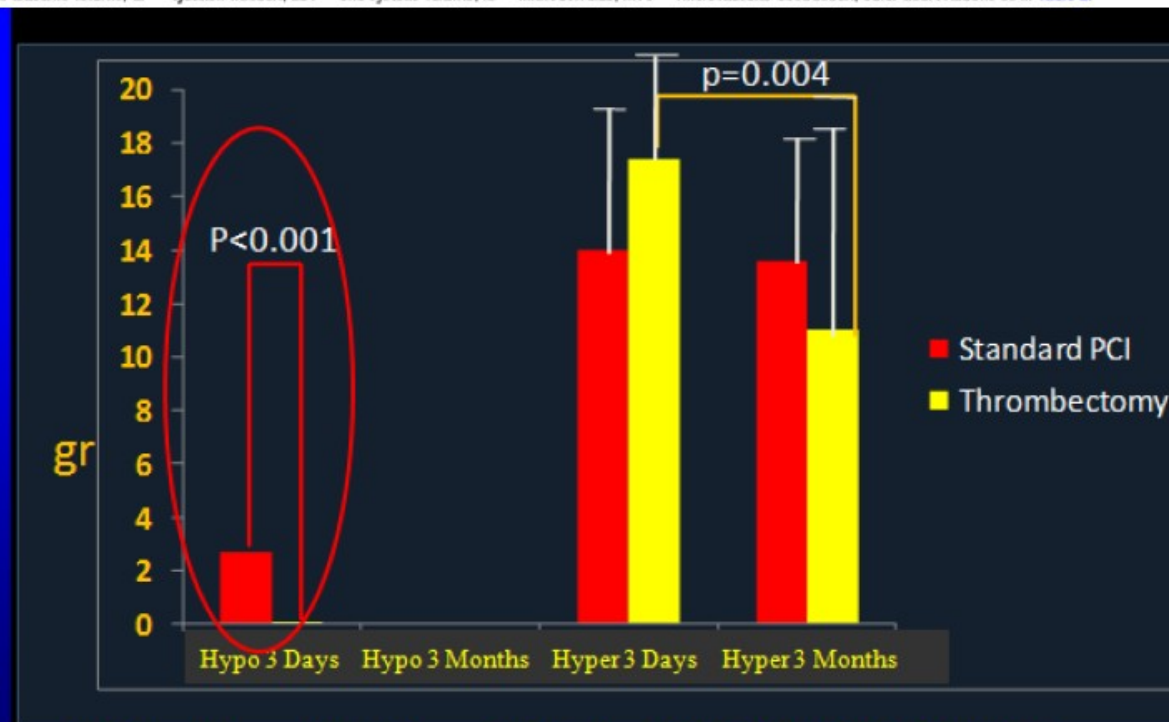
Table 4 Cardiac Magnetic Resonance Imaging Results

	Acute Phase			3-Month Follow-Up		
	S-PCI (n = 37)	EM-PCI (n = 38)	p Value	S-PCI (n = 36)	EM-PCI (n = 36)	p Value
EDV, ml	137.5 ± 18.6	131.5 ± 14.4	0.1	144.5 ± 20.3	136.2 ± 19.9	0.08
ESV, ml	77.4 ± 15.4	71.3 ± 17.3	0.1	76.1 ± 16.5	69.3 ± 17.7	0.09
EF, %	44.3 ± 9.5	46.3 ± 8.6*	0.3	46.7 ± 10.6	49.0 ± 9.3*	0.3
IS, %	13 ± 6.7	14 ± 12†	0.6	11 ± 8.7	9 ± 4.5†	0.2
IS, g	14 ± 7.5	17 ± 15†	0.2	13 ± 12	11 ± 8.7†	0.4
MVO, n	27 (72.9%)	9 (31.5%)	0.0005	—	—	—
MVO, g	3.7 ± 2.6	1.7 ± 1.9	0.0003	—	—	—

*p = 0.08. †p = 0.001 ‡p = 0.004.

EDV = end-diastolic volume; EF = ejection fraction; ESV = end-systolic volume; IS = infarction size; MVO = microvascular obstruction; other abbreviations as in Table 1.

**75 patients w.
Anterior AMI**



Impact of Thrombectomy with **EXPort** catheter in **Infarct Related Artery** during Primary PCI on Procedural Outcome in patients with AMI (**EXPIRA Trial**). **24 Months Clinical Outcome**

Medication administration at 2-years follow-up

	Total (n = 175)	S-PCI (n = 87)	EM-PCI (n = 88)	p Value
Pharmacological therapy (%)				
Aspirin	152 (86.8)	67 (82.7)	76 (86.4)	0.53
Clopidogrel	10 (5.9)	4 (4.9)	5 (5.7)	1.00
Coumarin derivatives	5 (2.9)	2 (2.4)	3 (3.4)	1.00
Statins	155 (91.7)	74 (91.3)	81 (92)	1.00
B-blocker	148 (87.6)	69 (85.2)	79 (89.7)	0.44
Calcium channels blockers	30 (17.7)	13 (16)	17 (19.3)	0.68
Nitrates	15 (8.9)	6 (7.4)	9 (10.2)	0.59
Angiotensin-converting-enzyme inhibitor	100 (59.2)	47 (58)	53 (60.2)	0.87
Angiotensin-II receptor antagonists	35 (20.7)	15 (18.5)	20 (22.7)	0.57
Diuretics	40 (23.7)	19 (23.4)	21 (23.8)	1.00





Impact of Thrombectomy with **EXPort** catheter in **Infarct Related Artery** during Primary PCI on Procedural Outcome in patients with AMI (**EXPIRA Trial**). **24 Months Clinical Outcome**

Adverse clinical events at 2 years follow up .

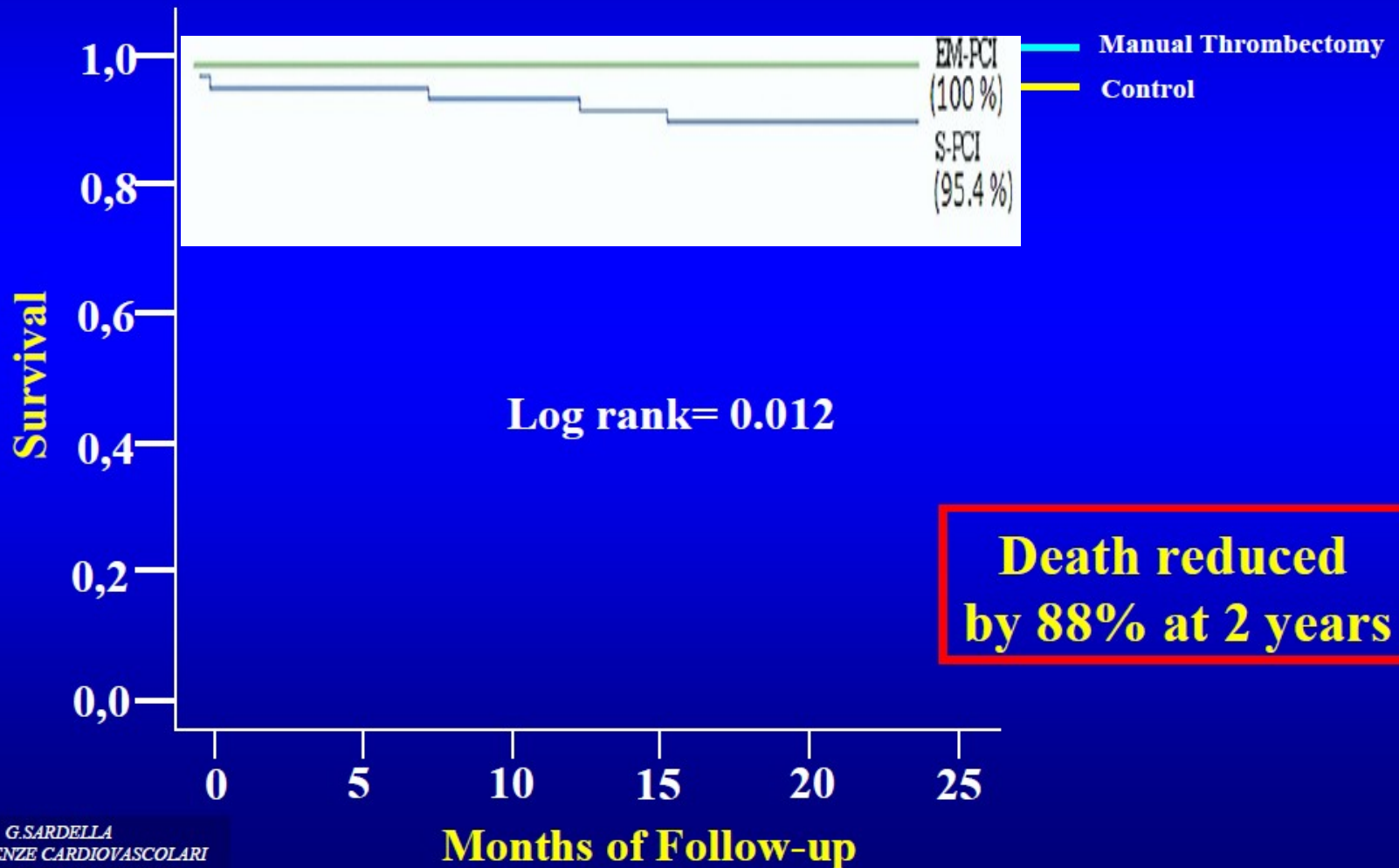
Variables	Conventional PCI (n=87)	Thrombus Aspiration (n=88)	HR (95% CI)	p values
Cardiac death	6 (6.8%)*	0 (0%)	6.657 (1.642 – 8.457)	0.0001
Reinfarction	1 (1.1%)	0 (0%)	-	0.999
TVR	5 (5.7%)	4 (4.5%)	1.302 (0.351 – 4.848)	0.651
MACE	12 (13.6%)	4 (4.5%)	3.105 (1.002 – 9.629)	0.050
Definite VLST	0 (0%)	0 (0%)	-	-





Impact of Thrombectomy with EXPort catheter in Infarct Related Artery during Primary PCI on Procedural Outcome in patients with AMI (EXPIRA Trial). 24 Months Clinical Outcome

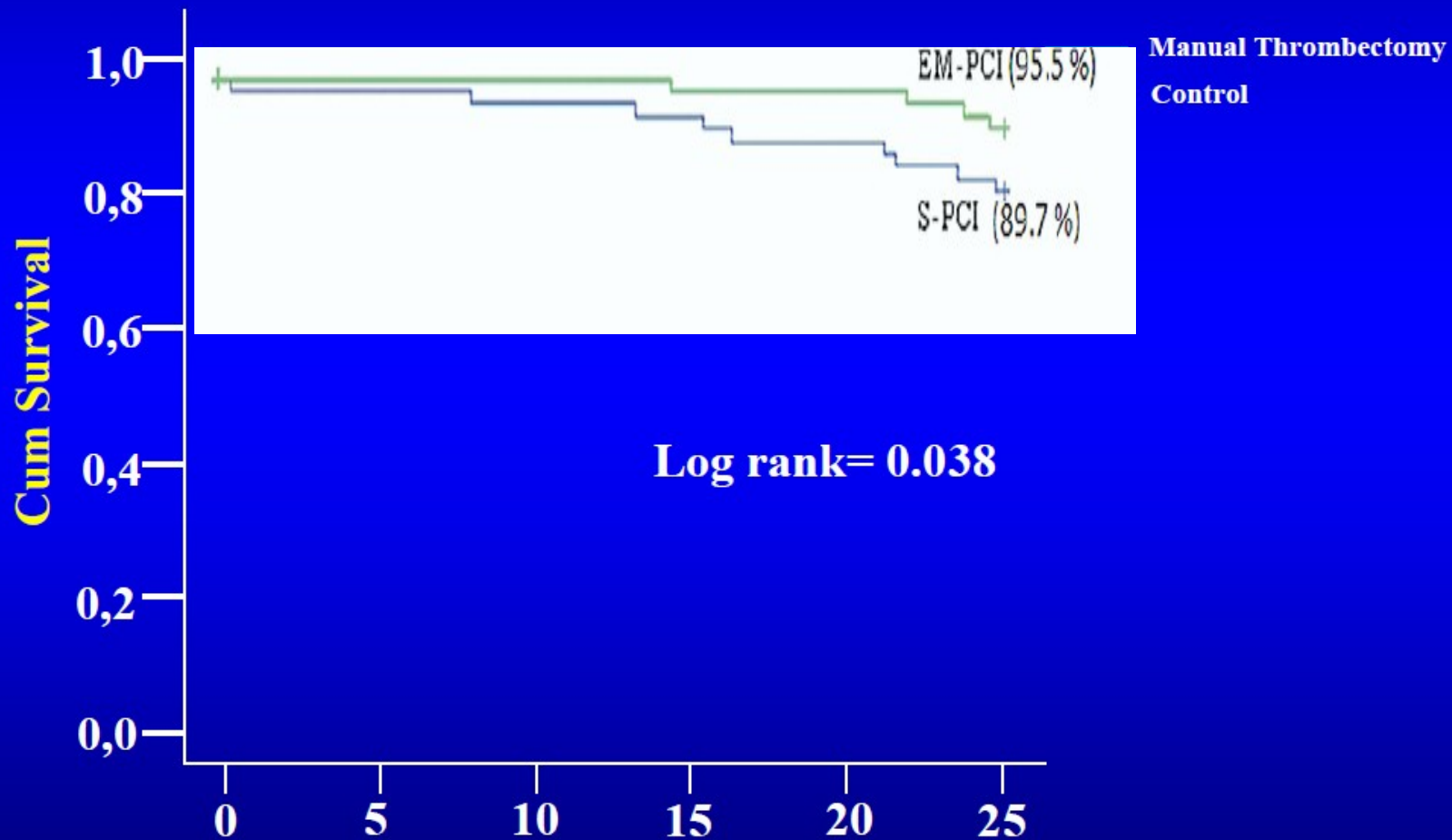
2-years Survival-free from Cardiac Death





Impact of Thrombectomy with **EX**Port catheter in **I**nfarct **R**elated **A**rtery during Primary PCI on Procedural Outcome in patients with AMI (**EXPIRA** Trial). **24** Months **C**linical **O**utcome

2-years Cumulative Event-Free Survival





Impact of Thrombectomy with **EXPort** catheter in **Infarct Related Artery** during Primary PCI on Procedural Outcome in patients with AMI (**EXPIRA Trial**). **24 Months Clinical Outcome**

Univariate and multivariate analysis for cardiac death

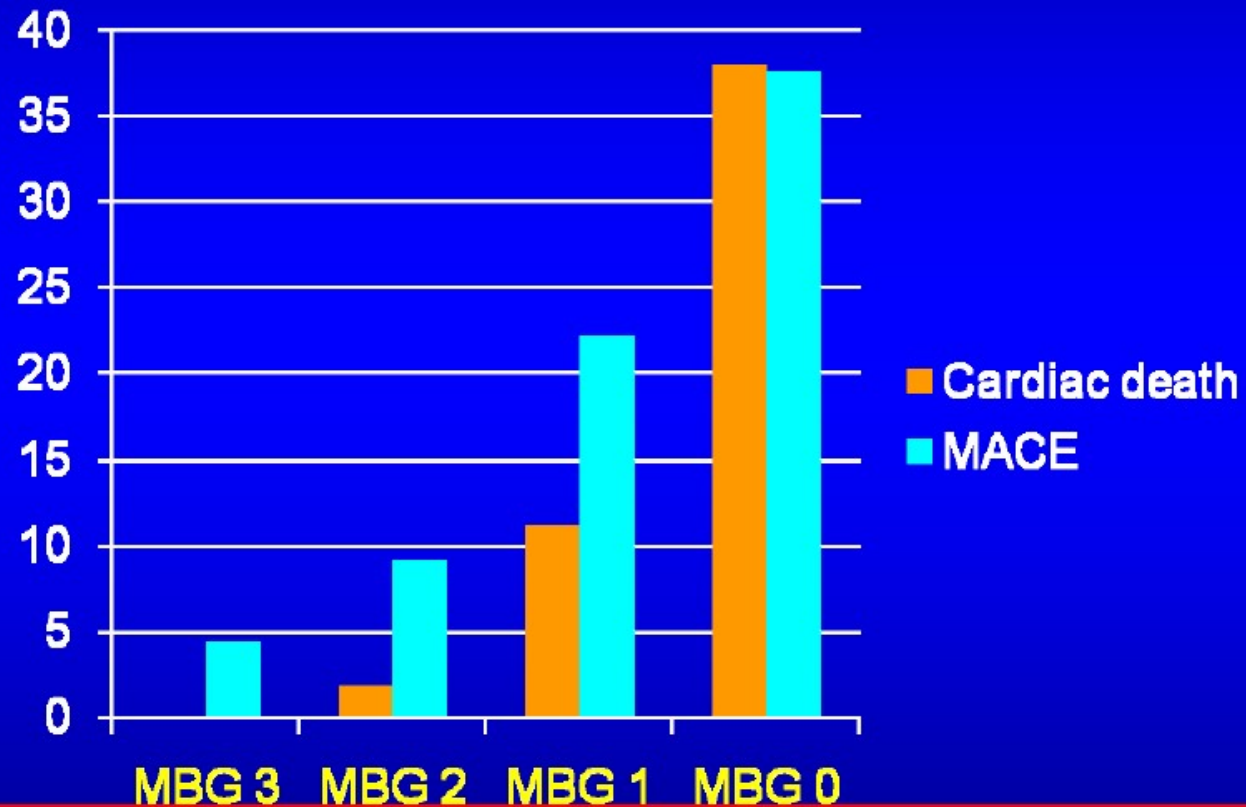
Variables	Univariate analysis HR (95% CI)	p values	Multivariate analysis HR (95% CI)	p values
Randomization to Thrombus Aspiration	0.015 (0.004 – 0.370)	0.021	0.12 (0.006 – 0.251)	0.006
Age	1.004 (0.928 – 1.086)	0.215	1.508 (1.055 – 2.156)	0.024
Diabetes	6.970 (1.276 – 15.061)	0.025		
Hypertension	3.634 (0.425 – 11.109)	0.239		
Symptoms to Balloon Time	1.145 (1.041 – 1.258)	0.005	1.322 (1.078 – 1.622)	0.007
Final MBG < 2	8.833 (0.998 – 18.658)	0.193		





Impact of Thrombectomy with **EX**Port catheter in **Infarct Related Artery** during Primary PCI on Procedural Outcome in patients with AMI (**EXPIRA** Trial). **24 Months Clinical Outcome**

Relation between Final Myocardial Blush Grade and Cardiac Death and MACE at 2-years follow-up.

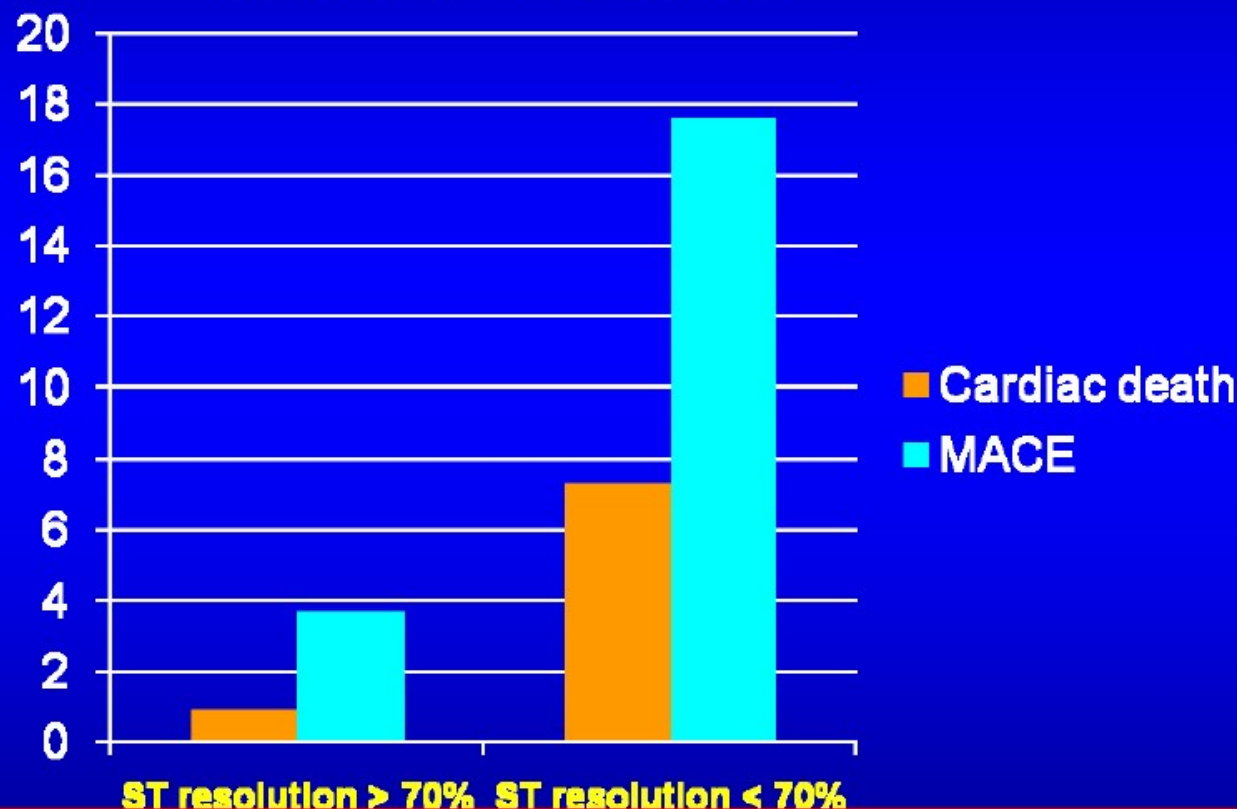


Cardiac death (%)	0	1.8	11.1	38	0.001
MACE (%)	4.3	9.1	22.2	37.5	0.003



Impact of Thrombectomy with **EX**Port catheter in **I**nfarct **R**elated **A**rtery during Primary PCI on Procedural Outcome in patients with AMI (**EXPIRA** Trial). 24 Months Clinical Outcome

Relation between % ST-segment resolution and Cardiac Death and MACE at 2-years follow-up.



Cardiac death (%)	0.9	7.3	0.023
MACE (%)	3.7	17.6	0.002





- ❖ In our experience **Thrombectomy** during Primary PCI has been demonstrated to be safe and effective **improving myocardial perfusion and reducing infarct size**.
- ❖ In this study a **very long term follow-up (>1 year)** was assessed in the setting of primary PCI treated with adjunctive manual thrombectomy.
- ❖ A pretreatment with manual thrombectomy results in a **lower cardiac mortality and a lower incidence of other MACEs at 2-year follow-up** than conventional therapy alone.
- ❖ We observed that the occurrence of cardiac death and MACE is significantly **related to final MBG and ST-segment resolution**.
- ❖ The major limitations of our study are the **limited number of patients** and that **was not powered** to investigate the magnitude of the effect of thrombus aspiration on hard MACE that requests more powered RCT's.





- ❖ **In our experience Thrombectomy has been demonstrated to be safe and effective in AMI setting during Primary PCI.**
- ❖ **Compared with conventional stenting, in patients with intracoronary visible and occlusive thrombus, pretreatment with manual aspiration thrombectomy during primary PCI improves acutely the parameters of myocardial tissue perfusion and ST resolution in a well selected population.**
- ❖ **The difference observed in term of Systolic Strain between the two groups suggest a rapid and better segmental function recovery in pts treated with Thrombectomy.**
- ❖ **These data also confirm that Systolic Strain after primary PCI could be useful to evaluate if primary percutaneous reperfusion has been effective in terms of function recovery.**



- ❖ For the first time a very long term follow-up (>1 year) was assessed in the setting of primary PCI treated with adjunctive manual thrombectomy.
- ❖ The main finding of the present study is that a pre-treatment with manual thrombectomy during primary PCI results in a lower cardiac mortality and a lower incidence of other MACEs at 2-year follow-up than conventional therapy alone.
- ❖ Our findings are in agreement with the results of the recently published single-centre TAPAS trial and the ATTEMPT study, the benefit of improved myocardial reperfusion seen in the EM-PCI resulted in a significant improvement of long term clinical outcome.
- ❖ We observed that the occurrence of cardiac death and of MACE is significantly related to final MBG and ST-segment resolution as previously reported.
- ❖ Our Study represents a single-center experience with a limited number of patients.
- ❖ EXPIRA was designed to detect differences in myocardial reperfusion and it was not powered to investigate the magnitude of the effect of thrombus aspiration on clinical outcome. Nevertheless Kaplan Meier analysis showed a reduced mortality in patients randomized to manual thrombectomy with a mortality reduction of 88% (HR 0.12) at multivariate analysis.