Clinical trials of angiotensin-Converting Enzyme Inhibitors for acute myocardial infarction in systematic early treatment (with or without sign of HF)

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1 angiotensin-converting enzyme inhibitors

Trial	Treatments	Patients	Trials design and methods
irbesartan vs control			
GLOBAL *ongoing* [NCT00125645] n=NA follow-up: 3 months	irbesartan versus usual care	patients with acute myocardial infarction, a wall motion score >1.3 (EF>0.40) and signs of diastolic dysfunction	Parallel groups open
captopril vs placebo			
Bussmann , 1992 n=22/24 follow-up: 48h	slow intravenous bolus injection of 2.5 or 5.0 mg captopril followed by a continuous infusion of 1.5-2.0 mg/h for a period of 48 hours versus placebo	patients with acute myocardial infarction	Parallel groups double blind
CATS , 1996 n=149/149 follow-up: 1 year	captopril 25 mg three times a day versus placebo	patients with a first anterior myocardial infarction treated with intravenous streptokinase within 6h of onset of symptoms	Parallel groups double blind The Netherlands
CCS-1 , 1995 n=13634 follow-up: 1 month	captopril6.25 mg initial dose, 12.5 mg 2 h later, and then 12.5 mg three times daily for 28 days versus placebo	Acute MI <36h of MI	Parallel groups double blind China
Di Pasquale , 1997 n=31/30 follow-up: 12h	captopril first dose 2-4 h after starting thrombolysis (the dose was then increased up to 25 mg every 8 h versus placebo	patients hospitalized for suspected anterior AMI within 4 h from the onset of symptoms suitable for thrombolysis	Parallel groups double blind italy
Di Pasquale , 1994 n=188/183 follow-up: 2h	captopril, 6.25 mg, orally 15 min before thrombolysis versus placebo before thrombolysis	patients with acute myocardial infarction , hospitalized within 4 h of the onset of symptoms	Parallel groups double blind Italy
ECCE , 1997 n=104/104 follow-up: 1 month	captopril titrated dose in order to preserve their blood pressure versus placebo	patients with acute myocardial infarction	Parallel groups double blind

continued...

Trial	Treatments	Patients	Trials design and methods
French , 1999 n=243/250 follow-up: 1 year	captopril 6.25 mg, increasing to 50 mg t.d.s. versus placebo	patients aged <or = 75 years with first infarctions, presenting within 4 h of symptom onset	Parallel groups double blind New Zealand
Galcera , 1993 n=21/22 follow-up: 14 days	captopril versus placebo	patients with a first acute myocardial infarction and a pulmonary capillary pressure equal or above 17 mmHg	Parallel groups double blind
Hargreaves , 1992 n=36/36 follow-up: 28 days	12.5 mg of captopril three times daily versus placebo	patients with acute myocardial infarction (systolic blood pressure >90 mm Hg) within 24 hours of the start of pain	Parallel groups double blind UK
ISIS-4 , 1995 n=29028/29022 follow-up: 1 month	captopril 6.25mg twice daily initialy titrated up to 50 mg twice daily (for 1 month) versus placebo	Acute MI <24h of MI, no cardiogenic shock or persistent severe hypotension	Factorial plan double blind 31 countries
Nabel , 1991 n=20/18 follow-up: 3 months	intravenous followed by oral captopril versus placebo	patients with myocardial infarction	Parallel groups double blind
Ray , 1993 n=99 follow-up: 1 year	captopril 25 mg three times a day versus placebo	haemodynamically stable patients with acute myocardial infarction, selected on clinical grounds as being at risk of late ventricular dilatation	Parallel groups double blind Glasgow
Sharpe , 1991 n=100 follow-up: 3 months	captopril 50 mg twice daily versus placebo	patients with Q wave myocardial infarction, but without clinical heart failure 24-48h after onset of symptoms	Parallel groups double blind
captopril or enalapril vs placebo			
PRACTICAL (captopril) , 1994 n=150/75 follow-up: 1 year	captopril 25 mg three times daily or enalapril 5 mg three times daily versus placebo	patients with acute myocardial infarction within 24 hours of onset	Parallel groups double blind
enalapril vs placebo			
CONSENSUS 2 , 1992 n=3044/3046 follow-up: 6 months	enalapril (1 mg IV infusion +5-20 mg PO daily) for 6 months versus placebo	patients with acute myocardial infarctions and blood pressure above 100/60 mm Hg, <24h of MI	Parallel groups double blind Scandinavia
Schulman , 1995 n=22/21 follow-up: 1 year	intravenous enalaprilat (1 mg) then oral treatment for 1 month versus placebo	patients with an acute Q-wave AMI within 24 hours of symptom onset	Parallel groups double blind US
fosinopril vs placebo			
FAMIS , 1998 n=142/143 follow-up: 2 years	fosinopril versus placebo	patients with anterior acute myocardial infarction within 9 hours of onset	Parallel groups double blind Italy
lisinopril vs placebo			

continued...

Trial	Treatments	Patients	Trials design and methods
GISSI 3 , 1994 n=9435/9460 follow-up: 6 months	lisinopril (5 mg initial dose and then 10 mg daily) for 42 days versus open control	Acute MI <24h of MI	Factorial plan open Italy
ramipril vs placebo			
Wagner , 2002 n=51/48 follow-up: 7 days	2.5 mg ramipril orally prior to thrombolysis and 12 h later versus placebo	patients with acute myocardial infarction	Parallel groups double blind
zofenopril vs placebo			
SMILE , 1995 n=772/784 follow-up: 1 year	zofenopril initial dose 7.5 mg, up to a tagert dos eof 30mg twice daily versus placebo	patients within 24 hours after a acute anterior myocardial infarction who were not undergoing thrombolysis	Parallel groups double blind Italy

References

GLOBAL, :

Bussmann, 1992:

Bussmann WD, Micke G, Hildenbrand R, Klepzig H Jr [Captopril in acute myocardial infarct: its effect on infarct size and arrhythmias] Dtsch Med Wochenschr 1992;117:651-7 [1572248]

CATS, 1996:

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Di Pasquale P, Valdes L, Albano V, Bucca V, Scalzo S, Pieri D, Maringhini G, Paterna S Early captopril treatment reduces plasma endothelin concentrations in the acute and subacute phases of myocardial infarction: a pilot study. J Cardiovasc Pharmacol 1997;29:202-8 [9057069]

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Sharpe, 1991:

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PRACTICAL (captopril), 1994:

Foy SG, Crozier IG, Turner JG, Richards AM, Frampton CM, Nicholls MG, Ikram H Comparison of enalapril versus captopril on left ventricular function and survival three months after acute myocardial infarction (the "PRACTICAL" study). Am J Cardiol 1994;73:1180-6 [8203335]

CONSENSUS 2, 1992:

Swedberg K, Held P, Kjekshus J, Rasmussen K, Ryden L, Wedel H Effects of the early administration of enalapril on mortality in patients with acute myocardial infarction. Results of the Cooperative New Scandinavian Enalapril Survival Study II (CONSENSUS II) N Engl J Med 1992 Sep 3;327:678-84 [1495520]

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FAMIS, 1998:

Borghi C, Marino P, Zardini P, Magnani B, Collatina S, Ambrosioni E Short- and long-term effects of early fosinopril administration in patients with acute anterior myocardial infarction undergoing intravenous thrombolysis: results from the Fosinopril in Acute Myocardial Infarction Study. FAMIS Working Party. Am Heart J 1998;136:213-25 [9704681]

GISSI 3, 1994:

GISSI-3: effects of lisinopril and transdermal glyceryl trinitrate singly and together on 6-week mortality and ventricular function after acute myocardial infarction. Gruppo Italiano per lo Studio della Sopravvivenza nell'infarto Miocardico. Lancet 1994 May 7;343:1115-22 [7910229]

Wagner, 2002:

Wagner A, Herkner H, Schreiber W, Bur A, Woisetschlger C, Stix G, Laggner AN, Hirschl MM Ramipril prior to thrombolysis attenuates the early increase of PAI-1 in patients with acute myocardial infarction. Thromb Haemost 2002;88:180-5 [12195686]

SMILE, 1995:

Ambrosioni E, Borghi C, Magnani B The effect of the angiotensin-converting-enzyme inhibitor zofenopril on mortality and morbidity after anterior myocardial infarction. The Survival of Myocardial Infarction Long-Term Evaluation (SMILE) Study Investigators. N Engl J Med 1995 Jan 12;332:80-5 [7990904]

2 intravenous ACEI

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The TrialResults-center database provides a unique view of the treatment efficacy based on all data provided directly from clinical trial results, offering a valuable alternative to personal bibliographic search, published meta-analysis, etc. Furthermore, it would allow comparing easily the various concurrent therapeutic for the same clinical condition.

Rigorous meta-analysis method is used to populate TrialResults-center: widespread search of published and non published trials, study selection using pre-specified criteria, data extraction using standard form.

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