



## Clinical trial results:

### Use of Esmolol for Tight Heart Rate Control for 24 Hours in Patients with Acute ST Elevation Myocardial Infarction: The BEtA-Blocker Therapy in Acute Myocardial Infarction (BEAT-AMI) Trial

**Study Title:** Herzfrequenzkontrolle nach akutem Myokardinfarkt ("Heart rate control after acute myocardial infarct")

## Study Short Title: STEMI

### Summary

EudraCT number	2011-000911-26
Trial protocol	DE
Global end of trial date	24 February 2014

### Results information

Result version number	v1 (current)
This version publication date	18 September 2021
First version publication date	18 September 2021
Summary attachment (see zip file)	STEMI_Summary_report (STEMI_Kurzabschlussbericht_Behörden_v1-04-F_Summary_EU-CTR.pdf)

### Trial information

#### Trial identification

Sponsor protocol code	Uni-Koeln-1392
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#### Additional study identifiers

ISRCTN number	-
ClinicalTrials.gov id (NCT number)	-
WHO universal trial number (UTN)	-
Other trial identifiers	DRKS number: DKRS00000766

Notes:

### Sponsors

Sponsor organisation name	University of Cologne
Sponsor organisation address	Albertus-Magnus-Platz, Cologne, Germany, 50923
Public contact	Priv.-Doz. Dr. Er, Klinikum Guetersloh, Department of Internal Medicine 1, +49 54218324402, Fikret.Er@klinikum-guetersloh.de
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Notes:

### Paediatric regulatory details

Is trial part of an agreed paediatric investigation plan (PIP)	No
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Does article 45 of REGULATION (EC) No 1901/2006 apply to this trial?	No
Does article 46 of REGULATION (EC) No 1901/2006 apply to this trial?	No

Notes:

## Results analysis stage

Analysis stage	Final
Date of interim/final analysis	19 February 2015
Is this the analysis of the primary completion data?	Yes
Primary completion date	24 February 2014
Global end of trial reached?	Yes
Global end of trial date	24 February 2014
Was the trial ended prematurely?	No

Notes:

## General information about the trial

Main objective of the trial:

To evaluate the efficacy and safety of esmolol-induced heart rate control as compared with placebo when used in addition to standard medical therapy in patients with acute ST elevation myocardial infarction (STEMI) in reducing final infarct size reflected by Troponin T release.

Protection of trial subjects:

The trial was conducted according to Good Clinical Practice guidelines, the applicable local laws, and in accordance with the ethical principles that have their origins in the Declaration of Helsinki. The competent authorities approved the trial as required by national regulations. Regulatory authorities were notified of the trial and amendments as required by national regulations.

Background therapy:

After successful percutaneous coronary intervention (PCI) all patients are getting treated in line with current national and international cardiology Guidelines. This Treatment usually consists of an ACE inhibitor, an oral beta blocker, Aspirin, an ADP receptor antagonist, a statine as well as unfractionated heparin.

Evidence for comparator: -

Actual start date of recruitment	13 October 2011
Long term follow-up planned	No
Independent data monitoring committee (IDMC) involvement?	No

Notes:

## Population of trial subjects

### Subjects enrolled per country

Country: Number of subjects enrolled	Germany: 100
Worldwide total number of subjects	100
EEA total number of subjects	100

Notes:

### Subjects enrolled per age group

In utero	0
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Preterm newborn - gestational age < 37 wk	0
Newborns (0-27 days)	0
Infants and toddlers (28 days-23 months)	0
Children (2-11 years)	0
Adolescents (12-17 years)	0
Adults (18-64 years)	50
From 65 to 84 years	50
85 years and over	0

## Subject disposition

### Recruitment

Recruitment details:

Date of first enrollment (FPFV): 13.10.2011

Date of last completed (LPLV): 24.02.2014

### Pre-assignment

Screening details:

Patients admitted with acute ST elevation myocardial infarction were screened. Subjects underwent timely successful percutaneous intervention were identified. Eligible subjects were included and randomly allocated to receive esmolol or placebo for 24 Hours.

### Period 1

Period 1 title	Overall trial (overall period)
Is this the baseline period?	Yes
Allocation method	Randomised - controlled
Blinding used	Single blind
Roles blinded	Subject

Blinding implementation details:

Because study drug esmolol has an obvious effect on heart rate and blood pressure and due to safety reasons drug-administrating physician was not blinded. Follow up data acquisition was strictly performed in a blinded manner of physician and patient.

### Arms

Are arms mutually exclusive?	Yes
<b>Arm title</b>	Esmolol

Arm description:

24 hours tight heart rate Control with intravenous esmolol infusion

Arm type	Experimental
Investigational medicinal product name	Esmolol
Investigational medicinal product code	
Other name	Brevibloc
Pharmaceutical forms	Infusion
Routes of administration	Intravenous use

Dosage and administration details:

Successive, body-weight adapted i.v. administration, maximal dose 200µg/kg kg/min as maintenance dose

<b>Arm title</b>	Placebo
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Arm description:

24 hours intravenous placebo infusion

Arm type	Placebo
Investigational medicinal product name	Placebo (NaCl 0,9%)
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Infusion
Routes of administration	Intravenous use

Dosage and administration details:

250ml Infusionslösung

<b>Number of subjects in period 1</b>	Esmolol	Placebo
Started	50	50
Completed	50	50

## Baseline characteristics

### Reporting groups

Reporting group title	Esmolol
Reporting group description: 24 hours tight heart rate Control with intravenous esmolol infusion	
Reporting group title	Placebo
Reporting group description: 24 hours intravenous placebo infusion	

Reporting group values	Esmolol	Placebo	Total
Number of subjects	50	50	100
Age categorical Units: Subjects			
Age continuous Units: years arithmetic mean standard deviation	57.9 ± 11.2	61.4 ± 12.2	-
Gender categorical Units: Subjects			
Female	9	14	23
Male	41	36	77

## End points

### End points reporting groups

Reporting group title	Esmolol
Reporting group description: 24 hours tight heart rate Control with intravenous esmolol infusion	
Reporting group title	Placebo
Reporting group description: 24 hours intravenous placebo infusion	

### Primary: Maximum change in Troponin-T-concentration from baseline to 48 hours

End point title	Maximum change in Troponin-T-concentration from baseline to 48 hours <sup>[1]</sup>
End point description: ITT population	
End point type	Primary
End point timeframe: 48 hours post baseline	

Notes:

[1] - No statistical analyses have been specified for this primary end point. It is expected there is at least one statistical analysis for each primary end point.

Justification: For statistical analysis see attached summary report

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[2]</sup>	50 <sup>[3]</sup>		
Units: ng/ml				
arithmetic mean (standard error)	2.3 ( $\pm$ 3.1)	3.8 ( $\pm$ 4.5)		

Notes:

[2] - ITT population

[3] - ITT population

### Statistical analyses

No statistical analyses for this end point

### Secondary: Time to peak Troponin T

End point title	Time to peak Troponin T
End point description:	
End point type	Secondary
End point timeframe: baseline to 48h	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: hours				
arithmetic mean (standard deviation)	14 ( $\pm$ 11.8)	9.6 ( $\pm$ 8.7)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Area under the Curve (AUC) of Troponin T release

End point title	Area under the Curve (AUC) of Troponin T release
End point description:	
End point type	Secondary
End point timeframe:	
baseline to 48h	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: ng*h/ml				
arithmetic mean (standard deviation)	90.6 ( $\pm$ 108.3)	119.1 ( $\pm$ 114.4)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Mean heart rate during study intervention

End point title	Mean heart rate during study intervention
End point description:	
Heart rate was measured at 0, 6, 12, 18 and 24 hours.	
End point type	Secondary
End point timeframe:	
mean value from a 24 hours period	



End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: beats per minute (bpm)				
arithmetic mean (standard deviation)	68.1 (± 9.3)	72.6 (± 11.3)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Area under the curve (AUC) NT-proBNP

End point title	Area under the curve (AUC) NT-proBNP
End point description: NT-proBNP: N-terminal pro brain natriuretic peptide.	
End point type	Secondary
End point timeframe: within 0h (baseline) to 48 hours	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: pg*h/ml				
arithmetic mean (standard deviation)	48873.6 (± 38371.8)	86331.8 (± 101952.6)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: 6-minute walk test

End point title	6-minute walk test
End point description:	
End point type	Secondary
End point timeframe: 6 weeks and 6 months	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[4]</sup>	49 <sup>[5]</sup>		
Units: meter				
arithmetic mean (standard deviation)				
6 weeks	517.3 (± 114.5)	456.0 (± 146.4)		
6 months	494.9 (± 150.2)	450.0 (± 146.9)		

Notes:

[4] - 49 for 6 weeks, 50 for 6 months

[5] - 49 for 6 weeks, 48 for 6 months

## Statistical analyses

No statistical analyses for this end point

## Secondary: Echocardiography-ejection fraction

End point title	Echocardiography-ejection fraction
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End point description:

End point type	Secondary
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End point timeframe:

post baseline, after 6 weeks, after 6 months

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[6]</sup>	50 <sup>[7]</sup>		
Units: percent volume/volume				
arithmetic mean (standard deviation)				
post-intervention	58.8 (± 10.2)	55.0 (± 11.7)		
after 6 weeks	62.5 (± 8.8)	58.6 (± 9.3)		
change in ejection fr.: post-int. to 6 w.	3.5 (± 7.5)	3.3 (± 9.6)		
after 6 months	61.7 (± 9.6)	60.1 (± 10.1)		
change in ejection fr.: post-int. to 6 mths.	2.9 (± 9.3)	4.4 (± 10.0)		

Notes:

[6] - 49 for: ejection fr. after 6 w. and for change in ejection fr. from post-int. to 6 weeks

[7] - 49 for ejection fr. after 6 weeks and change post-int. to 6 w.

48 for 6 mths. values

## Statistical analyses

No statistical analyses for this end point

## Secondary: Rehospitalisation

End point title	Rehospitalisation
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End point description:

End point type	Secondary
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End point timeframe:  
6 weeks and 6 months after baseline

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[8]</sup>	49		
Units: Events				
6 weeks	7	7		
6 months	13	13		

Notes:

[8] - 49 for 6 weeks, 50 for 6 months

### Statistical analyses

No statistical analyses for this end point

### Secondary: quality of life test

End point title	quality of life test
End point description: Change in score between baseline and timepoint	
End point type	Secondary
End point timeframe: 6 weeks and 6 months	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[9]</sup>	49		
Units: score				
arithmetic mean (standard deviation)				
6 weeks after baseline	0.0 ( $\pm$ 0.1)	0.0 ( $\pm$ 0.2)		
6 months after baseline	-0.1 ( $\pm$ 0.1)	0.0 ( $\pm$ 0.2)		

Notes:

[9] - 49 for 6 weeks, 50 for 6 months

### Statistical analyses

No statistical analyses for this end point

### Secondary: Repeat PCI

End point title	Repeat PCI
End point description: PCI: percutaneous coronary intervention	
End point type	Secondary

End point timeframe:  
PCI 6 weeks and 6 months after baseline

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	49		
Units: Events				
6 weeks	4	1		
6 months	8	5		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Reinfarction

End point title	Reinfarction
End point description:	
End point type	Secondary
End point timeframe:	
6 weeks and 6 months after baseline	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[10]</sup>	49		
Units: number of subjects with reinfarction				
6 weeks	0	0		
6 months	1	1		

Notes:

[10] - 49 for 6 weeks time point, 50 for 6 months timepoint

### Statistical analyses

No statistical analyses for this end point

### Secondary: Reintervention

End point title	Reintervention
End point description:	
End point type	Secondary
End point timeframe:	
6 weeks and 6 months after baseline	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[11]</sup>	49		
Units: Events				
6 weeks	4	1		
6 months	8	5		

Notes:

[11] - 49 for 6 weeks, 50 for 60 months

### Statistical analyses

No statistical analyses for this end point

### Secondary: Apoplex during follow-up

End point title	Apoplex during follow-up
End point description:	
End point type	Secondary
End point timeframe:	
6 weeks and 6 months after baseline	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	49	49 <sup>[12]</sup>		
Units: Study events				
6 weeks	0	0		
6 months	0	1		

Notes:

[12] - 49 subjects at 6 weeks timepoint, 48 subjects at 6 months timepoint

### Statistical analyses

No statistical analyses for this end point

### Secondary: Angina pectoris during follow-up

End point title	Angina pectoris during follow-up
End point description:	
CCS: Canadian Cardiovascular Society	
End point type	Secondary
End point timeframe:	
post-intervention, after 6 weeks, after 6 months	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[13]</sup>	50 <sup>[14]</sup>		
Units: Events				
Angina pectoris post-intervention CCS1/2	49	40		
Angina pectoris post-invervention CCS3/4	1	10		
Angina pectoris after 6 weeks CCS 1/2	47	43		
Angina pectoris after 6 weeks CCS 3/4	2	6		
Angina pectoris after 6 months CCS 1/2	47	41		
Angina pectoris after 6 months CCS 3/4	3	8		

Notes:

[13] - 50 post intervention, 49 after 6 weeks, 50 after 6 months

[14] - 50 post-intervention, 49 after 6 weeks, 49 after 6 months

### Statistical analyses

No statistical analyses for this end point

### Secondary: Death from any cause

End point title	Death from any cause
End point description:	
End point type	Secondary
End point timeframe: entire study	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: number of subjects	0	1		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Time to peak concentration NT-proBNP

End point title	Time to peak concentration NT-proBNP
End point description:	
End point type	Secondary

End point timeframe:  
baseline to 48 hours

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: hours				
arithmetic mean (standard deviation)	28.7 (± 16)	27.1 (± 11.3)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Neuropsychological status

End point title	Neuropsychological status
End point description: change in visual analogue scale (VAS) status compare to baseline	
End point type	Secondary
End point timeframe: 6 weeks, 6 months	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[15]</sup>	49		
Units: mm (visual analogue scale)				
arithmetic mean (standard deviation)				
6 weeks	-1.7 (± 16.3)	1.8 (± 18.4)		
6 months	2.7 (± 17.6)	0.4 (± 18.9)		

Notes:

[15] - 49 for 6 weeks, 50 for months

### Statistical analyses

No statistical analyses for this end point

### Secondary: Area under the Curve (AUC) creatinine kinase

End point title	Area under the Curve (AUC) creatinine kinase
End point description:	
End point type	Secondary
End point timeframe: from baseline to 48 hours	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: ng*h/ml				
arithmetic mean (standard deviation)	37152.1 (± 43683.0)	43576.4 (± 38663.1)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Time to peak creatinine kinase

End point title	Time to peak creatinine kinase
End point description:	
End point type	Secondary
End point timeframe: baseline to 48 hours	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: hours				
arithmetic mean (standard deviation)	14.4 (± 11.5)	10.0 (± 8.6)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Area under the curve (AUC) creatinine kinase MB

End point title	Area under the curve (AUC) creatinine kinase MB
End point description:	
End point type	Secondary
End point timeframe: baseline to 48 hours	



End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: U*h/l				
arithmetic mean (standard deviation)	3674.7 ( $\pm$ 3892.3)	4909.1 ( $\pm$ 4076.3)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Time to peak creatinine kinase MB

End point title	Time to peak creatinine kinase MB
End point description:	
End point type	Secondary
End point timeframe: baseline to 48 hours	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	50		
Units: hours				
arithmetic mean (standard deviation)	11.1 ( $\pm$ 7.9)	8.6 ( $\pm$ 3.7)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Change in endothelial progenitor cells CD34

End point title	Change in endothelial progenitor cells CD34
End point description:	
End point type	Secondary
End point timeframe: from baseline to 24 hours	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	49		
Units: counts				
arithmetic mean (standard deviation)	130.9 (± 50.4)	63.0 (± 47.2)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Change in endothelial progenitor cells KDR

End point title	Change in endothelial progenitor cells KDR
End point description:	
End point type	Secondary
End point timeframe: baseline to 24 hours	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	49		
Units: counts				
arithmetic mean (standard deviation)	40.6 (± 25.7)	18.7 (± 21.5)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Change in endothelial progenitor cells CD133

End point title	Change in endothelial progenitor cells CD133
End point description:	
End point type	Secondary
End point timeframe: baseline to 48 hours	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	49		
Units: counts				
arithmetic mean (standard deviation)	104.0 (± 47.2)	49.4 (± 37.7)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Change in endothelial progenitor cells CD117

End point title	Change in endothelial progenitor cells CD117
End point description:	
End point type	Secondary
End point timeframe: baseline to 24 hours	

End point values	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50	49		
Units: counts				
arithmetic mean (standard deviation)	119.6 (± 48.5)	56.1 (± 45.8)		

### Statistical analyses

No statistical analyses for this end point

### Secondary: Echocardiography-wall motion abnormality

End point title	Echocardiography-wall motion abnormality
End point description:	
End point type	Secondary
End point timeframe: post-intervention, 6 weeks and 6 months after intervention	

<b>End point values</b>	Esmolol	Placebo		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	50 <sup>[16]</sup>	50 <sup>[17]</sup>		
Units: patients				
post-intervention	39	46		
after 6 weeks	34	43		
after 6 months	35	44		

Notes:

[16] - 49 for 6 weeks values

[17] - 49 for 6 weeks and 6 months values

## Statistical analyses

No statistical analyses for this end point

## Adverse events

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### Adverse events information<sup>[1]</sup>

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Timeframe for reporting adverse events:

AEs from Baseline Visite 1 (0h) to Follow-up Visite 3(6mth)

Assessment type	Systematic
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### Dictionary used

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Dictionary name	MedDRA
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Dictionary version	17.0
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Frequency threshold for reporting non-serious adverse events: 0 %

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Notes:

[1] - There are no non-serious adverse events recorded for these results. It is expected that there will be at least one non-serious adverse event reported.

Justification: For Advers Event listing see attached summary report - safety

## More information

### Substantial protocol amendments (globally)

Were there any global substantial amendments to the protocol? No

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### Interruptions (globally)

Were there any global interruptions to the trial? No

### Limitations and caveats

None reported