Evolution of Left Ventricular Ejection Fraction After Acute Myocardial Infarction: Implications for Implantable Defibrillator Eligibility

Running title: Sjöblom et al.; ICD early after myocardial infarction

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Abstract

Background—ICD therapy improves survival in patients with reduced left ventricular ejection fraction (LVEF) after acute myocardial infarction (AMI). Although the risk of sudden cardiac death (SCD) is highest in the first month after AMI, there is no survival benefit of early ICD implantation and the optimal time frame has yet to be established. The aim of this study was to investigate what proportion of post-AMI patients improved their LV function to such extent that the indication for ICD was no longer present.

Methods and Results—Patients admitted for AMI with reduced LVEF (≤40%) were eligible for inclusion. Repeat echocardiographic examinations were performed five days, one and three months after the AMI. We prospectively included 100 patients with LVEF 31±5.8% after AMI. At one month follow-up, 55% had an LVEF >35%. The main improvement in LVEF had occurred by one month. The mean difference in LVEF over the next two months was small, 1.9 percentage units. During the first nine weeks 10% of the patients suffered from life-threatening arrhythmias.

Conclusions—Most patients improve their LVEF after AMI and in the majority the improvement could be confirmed after one month, implying that further delay of ICD implantation may not be warranted. Life-threatening arrhythmias occurred in 10% of the patients illustrating the high risk for SCD in this population.

Key words: implanted cardioverter defibrillator, acute myocardial infarction, left ventricular ejection fraction, sudden cardiac death, arrhythmia
Introduction

A significant proportion of deaths in patients with chronic ischemic cardiomyopathy are due to heart failure or sudden cardiac death (SCD)\(^1\). Numerous clinical trials have confirmed the benefit of implantable cardioverter defibrillator (ICD) treatment to patients with reduced left ventricular (LV) function following an acute myocardial infarction (AMI)\(^2-4\). Despite the risk of SCD being highest during the first month after AMI\(^5-7\), there is no benefit of ICD treatment early after myocardial infarction\(^5,8\). The DINAMIT and the IRIS studies showed that although ICD implantation early after AMI reduced the number of SCDs, the rates of non-arrhythmic deaths were increased\(^5,8\). It has been speculated that the factors associated with arrhythmias also implicate a high risk of non-sudden death, abolishing the benefit of ICD treatment\(^9\). Another explanation could be that the impaired LV function seen immediately after AMI to some extent is due to myocardial stunning. In previous studies improvement of the left ventricular ejection fraction (LVEF) has been observed in 30-50% of post-AMI patients\(^10-12\).

Guidelines advocate primary preventive ICDs to patients with LVEF ≤35% after more than 40 days after AMI, but a delay of at least three months is recommended after revascularization. Implantation of primary preventive ICDs is also recommended to patients with LVEF ≤40%, non-sustained ventricular arrhythmias (VT) due to prior AMI and inducible VT during electrophysiological studies\(^13\). The optimal timing for ICD implantation has not been evaluated in prospective studies\(^14\). A sub-study of MADIT II showed more benefit with ICD for patients with more remote AMI\(^15\), but post hoc analysis of the SCD-HeFT study implicate that the duration after AMI does not modify the effect of ICD on all-cause mortality\(^16\). However, a delayed decision regarding ICD after AMI is associated with a lower likelihood of implantation of a potentially lifesaving device\(^17,18\).
The aim of this study was to investigate what proportion of patients with reduced left ventricular function after an AMI reached an LVEF >35%, thereby no longer qualifying for ICD treatment. We also investigated the time to improvement in order to allow earlier identification of possible ICD candidates.

Methods

Patients admitted with AMI at Danderyd University Hospital or Södersjukhuset in Stockholm between November 2010 and December 2013 were eligible for participation in the study if a clinical echocardiography (ECHO) showed a LVEF of ≤40%. An AMI was defined according to the second and third universal definitions of myocardial infarction 19,20. All clinical ECHOs of potentially eligible patients were reviewed by a participating research cardiologist with echocardiographic expertise who confirmed that the LVEF indeed was ≤40% according to the modified Simpson biplane method at inclusion 21. Patients were excluded if they had short life expectancy (less than one year), if informed consent was not acquired or if more than eight days had passed since the AMI.

The ECHO was performed using a commercially available equipment (Vivid 7, GE Vingmed®, Horton, Norway) with a standard phased array 2.5 MHz multifrequency transducer. Standard echocardiographic recordings and calculations were performed according to the recommendations of the European Society of Echocardiography 21. Apical scans of the left ventricle in the four-chamber, two-chamber and apical long axis views were performed. Recordings were saved on a digital medium and post processed using a workstation (EchoPAC®, GE, Horton, Norway). LVEF was calculated according to the modified Simpson biplane method. If less than 80% of the endocardial border was adequately visualised, a contrast
agent (SonoVue®, Bracco Imaging) was used. A certified biomedical analyst with vast
echocardiographic experience performed the ECHOs before discharge (3-8 days after the AMI),
and again after one and three months respectively. The clinical ECHO which determined the
inclusion was called ECHO 1. The first study ECHO before discharge was named ECHO 2, the
ECHO performed after one month was called ECHO 3 and the ECHO performed three months
after the AMI was called ECHO 4.

Data regarding background demographic factors, ECG, results from coronary
interventions and medication was collected.

Two independent investigators performed all LVEF estimations. If there was a
discrepancy of more than 5 percentage units, a third investigator proceeded with the analysis, and
a consensus decision was reached. Assessment of the intra-observer and inter-observer
variability was performed by an additional reviewing and estimation of the LVEF in 20 random
examinations by three investigators blinded from the results of the others. One of the
investigators also analyzed the same examinations on two different occasions without
information of the previous results.

Statistics

In order to calculate the sample size we assumed a mean LVEF at baseline of 30%, and a
variance of 10%. The null hypothesis to be tested was that there is no difference in LVEF after 3
months and the alternative hypothesis was that there is a difference of more than 10 percentage
units in LVEF after 3 months. With the assumption that we have a drop out rate of 20%, we
calculated that enrolment of 100 patients would provide 80% power to detect a difference of at
least 10 percentage unit in LVEF. Sample size calculating was performed using IBM SPSS
Sample power V 2.0. Continuous data were presented as mean ± standard deviation or median
(range) when appropriate. Nominal data is presented as number of cases (%). Fisher's exact test was used for comparison between categorical variables and the student's paired t-test was used for comparison of continuous variables over time, when normal distribution was assumed. Normal distribution was tested with Shapiro-Wilks test and plots. If the parameters were normally distributed confidence intervals (CI) were calculated. When we did not assume normal distribution the Wilcoxon signed-rank test was used. Analysis of variance (ANOVA) was used when comparing more than two groups. A two sided p-value of <0.05 was considered statistically significant. Both the intra-observer and inter-observer variabilities were calculated as the mean percent error which was expressed as the absolute difference between two sets of observations divided by the mean of observations. A multiple logistic regression model was used to examine the value of different baseline characteristics as predictors of LVEF recovery and arrhythmic events. All statistical analyses were performed using IBM SPSS Statistics version 21.

Ethics

The study was performed in accordance with the Declaration of Helsinki and was approved by the Regional Ethical Review Board in Stockholm, Sweden (2010/882-31/2). All participants gave their written informed consent.

Results

There were 121 potential patients, but 21 were not included in the study due to disagreement of the LVEF estimation between the clinical ECHO and the ECHO core laboratory. Out of the 100 included patients with an LVEF ≤40% after AMI, nine patients dropped out before ECHO 2. Eight due to complications to the AMI (cardiac embolism, pulmonary embolism and six cases of
severe heart failure) and one because of poor imaging quality in spite of using ECHO contrast. The baseline characteristics are based on the remaining 91 patients. Five patients did not perform ECHO 3 and three patients did not perform ECHO 4 because of fatigue or Coronary Artery Bypass Surgery (CABG).

The intra-observer and inter-observer variabilities were 5±3% and 8±5% respectively.

**Baseline characteristics**

Clinical baseline characteristics are presented in Table 1. The majority of the study population were men. The most common comorbidities were hypertension and diabetes. There was no previously known heart disease in 66 patients (71%). Both mean and median LVEF at inclusion was 31% (range 17.5-40%). ST-elevation myocardial infarction (STEMI) was more common than non-STEMI and most patients had a stenosis in the left anterior descending artery (LAD), and were treated with percutaneous coronary intervention (PCI) (Figure 1). In total 78 patients (86%) were treated with PCI and 7 (7.7%) with coronary artery bypass surgery (CABG). Of these, 2 patients (2.2%) were treated with both PCI and CABG. Even if all patients in the study were considered for revascularization PCI was not possible in two patients, medical therapy was thought to be the best therapy in two patients, two patients had no stenosis and two patients refused coronary angiography.

**ECHO 1 versus ECHO 2**

The results of both the LV dimensions and LVEF measurements are shown in Table 2. There was on average three days between ECHO 1 and 2 but still, there was a small improvement in LVEF after this short time with in mean 1.3 percentage units (p=0.05 Wilcoxon signed-rank test). There was a statistically significant difference in LV end-diastolic diameter between ECHO 1 and 2 (5.2 ±0.8cm vs. 5.4±0.8cm, p<0.001) which was not considered of clinical importance.
ECHO 1-4

There was a general improvement in LVEF at one month that continued, albeit to a lesser extent, to the three-month ECHO (Table 2). After three months the ECHO results were widely divergent between patients, and the mean and median LVEF was 40 ±11% (range 10-60). The mean improvement in LVEF between ECHO 1 and 4 was 8.4 percentage units (95% CI 6.4-10, p<0.001) (Figure 2). Improvement in LVEF by ≥10 units was observed in 40 patients (47%). However, we also found a deterioration of >5 units in nine patients and ≥10 units in two.

After one month 38 patients (45%) had LVEF ≤35% and thereby an indication for primary preventive ICD. After three months follow-up six of these patients had improved further and did no longer meet the ICD criterion (mean LVEF 41%). The differences in LVEF between ECHO 3 and 4 was small but significant 1.9 percentage units (p=0.01).

Among the patients with LVEF > 35% at inclusion (n=17), two patients had a lower LVEF at three months and met the criteria for ICD. If the patients with LVEF 36-40% at inclusion were excluded it did not affect the main result and 50% (n=34) of the patients with LVEF ≤35% at inclusion had still improved their LVEF at 1 month to such a degree that an ICD was no longer indicated. The mean improvement in LVEF between ECHO 1 and 4 was, among these patients, 7.9 percentage units.

Among the eight patients who were not successfully revascularized, two patients improved and had LVEF ≥35% at both one and three months of follow up (LVEF 47% and 60% after one month).

There were no clinically important differences in LV end-diastolic diameters between ECHO 1-4.

Patients with LVEF >35% compared to those with LVEF ≤35% at 3 months follow up
The baseline characteristics of the patients with LVEF ≤35% at 3 months follow up are compared to the others in Table 3. Multiple regression with the cofactors e.g. previously known heart failure, previous AMI, LVEF at inclusion and three vessel disease showed that LVEF at inclusion was the only variable that significantly differed between the groups (odds ratio 0.82 CI 0.73-0.93 p=0.002). Among the 19 patients with an LVEF ≤25% at inclusion only two patients improved and did no longer meet the ICD criterion after three months (LVEF was 38% and 40% respectively).

**Early malignant ventricular arrhythmia or death**

Within three months after the AMI two patients died. The causes of death were severe infection in both cases, in addition one of the patients suffered a stroke and the other had severe heart failure after CABG.

During the first nine weeks, nine patients (10%) had life threatening arrhythmias. Out of these, seven patients required resuscitation from ventricular fibrillation or torsade de points. The other two patients had sustained ventricular tachycardia and one underwent direct current cardioversion while the other terminated spontaneously. All nine patients survived. The mean time from the AMI to the ventricular arrhythmia was 10 days (range 4-60 days), and four patients had already been discharged from the cardiology ward. The clinical characteristics of these patients were not particularly different from the patients without ventricular arrhythmias, apart from that the patients with arrhythmias more often had previous AMI and all patients were male (Table 4). Multiple regression analysis with the cofactors: previous AMI and gender showed that previous AMI was the best predictor of VT, but it was not significant (Odds ratio 4.3 CI 0.83-22.2 p=0.08). Three of the patients with ventricular arrhythmias had an LVEF of >35% at the three month follow-up (LVEF 43-58%).
Discussion

The main finding from this study is that among patients with an LVEF ≤40% after an AMI, the majority (55%) show rapid improvement to such extent after one month that there is no longer a clear indication for ICD treatment. This can be an explanation to the lack of benefit in mortality rates that has been seen with early ICD implantations after AMI.

Differences in LVEF between ECHO 1-4

Despite the fact that the time between ECHO 1 and 2 was only three days there was a small but significant improvement in LVEF, indicating that recovery of the LVEF is a rapid process starting early after the AMI.

This is further supported by the fact that the main improvement in LVEF occurred within one month and the differences in LVEF between one and three months was small (1.9 percentage units). Only six out of the 38 patients with LVEF ≤35% after one month improved to such extent that ICD was no longer indicated after three months. This results suggests that ICD implantation may be considered already after one month in patients with moderately impaired LVEF regardless of revascularization. Since earlier studies have demonstrated that a delayed decision regarding ICD after AMI is associated with a lower likelihood of implantation \(^{17,18}\), it would be beneficial to offer ICD treatment already at one month of follow-up.

Mildly impaired LVEF at inclusion

Although current international guidelines state that ICD therapy is warranted in patients with LVEF≤35% after prior AMI, we included patients with LVEF ≤40% in this study. The rationale behind this was that estimation of LVEF is challenging and Simpson’s rule requires accurate tracing of endocardial borders which sometimes can be difficult \(^{23}\). Interestingly, 10 patients
experienced deterioration in LVEF with ≥5 percentage units after discharge but only two of the
patients with LVEF 36-40% at inclusion met indication for ICD after three months. However,
even patients with a mildly reduced LVEF at discharge should receive optimized medical
therapy for congestive heart failure and be followed with repeat ECHO.

Early ventricular arrhythmia after AMI

Although the treatment for AMI has improved with early revascularization and modern drug
therapies, some patients develop a deteriorated heart function that may increase the risk for SCD.
In our study nine patients had life-threatening arrhythmias shortly after the AMI. In five patients
the arrhythmias occurred before discharge, and in the remaining four cases cardiopulmonary
resuscitation was commenced by bystanders. All nine patients survived. The patients in our study
who developed ventricular arrhythmias had similar LVEF at discharge (32%) as those without
arrhythmias. The high incidence of malignant arrhythmias illustrate the need of early
identification of patients suitable for ICD treatment. Perhaps ICD should be consider before
discharge among patients with severely impaired LV function, since only two patients with
LVEF ≤25% improved to such extent that ICD was not indicated after three months. Another
possible solution would be to offer life Vest defibrillators or subcutaneous ICDs to patients with
heart failure during the first month after AMI. The high occurrence of life-threatening
arrhythmias in this study illustrates the need of early identification of patients suitable for ICD
treatment.

Characteristics among patients with arrhythmias and low LVEF at follow up

In our study there were no significant differences between the nine patients who had life-
threatening arrhythmias and those who had not. This means that it is difficult to prevent SCD
that appears shortly after AMI. Neither were there any special features among patients who did
not improve their LV function other than very impaired LV function.

It would be beneficial to determine a method to predict which patients with reduced LVEF after AMI are not likely to improve, so that ICD treatment can be offered earlier, at a time when the risk of SCD is strikingly increased.

**Limitations**

One limitation is that LVEF estimation sometimes can be difficult due to lack of proper visualization of the endocardium. If that was the case, we used contrast agents and harmonics to increase the accuracy of the method. Another issue is the intra- and inter-observer variability among observers. The intra- and inter-observer variations for calculating LVEF can be high due to inappropriate quality of echo recordings. In our study we had relatively low intra- and inter-observer variabilities for calculating LVEF.

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**Conflict of Interest Disclosures:** All authors have completed the Unified Competing Interest form which is available on request from the corresponding author. Dr. J. Sjöblom has received research grants from Medtronic and Boston Scientific. Dr. Frykman has conducted studies in collaboration with Medtronic, and St. Jude Medical. Dr. Witt has received lecture fees from St Jude Medical. Dr. Muhrbeck and Dr. Alam have nothing to disclose.

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infarction in potential implantable cardioverter/defibrillator candidates: Insights from the
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BF, Williams DO, Armstrong PW, Antman EM, Fox KA, Hamm CW, Ohman EM, Simoons
LC, Fernandez-Aviles F, Fox KM, Parkhomenko AN, Priori SG, Tendera M, Voipio-Pulkki L-
C, Hellemans I, Kristensen SD, McGregor K, Sechtem U, Silber S, Tendera M, Widimsky P,
Steinhubl S, Levine GN, Gibler WB, Goff D, Tubaro M, Dudek D, Al-Attar N. - universal


Table 1. Baseline Characteristics (n=91)

<table>
<thead>
<tr>
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<th>Number (%)</th>
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<tr>
<td>Gender, male</td>
<td>71 (78)</td>
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<tr>
<td>Age mean ± SD</td>
<td>68±10</td>
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<tr>
<td>LVEF* at inclusion mean ± SD</td>
<td>31±5.8</td>
</tr>
<tr>
<td>Smoking</td>
<td>25 (28)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>43 (47)</td>
</tr>
<tr>
<td>Previous heart failure</td>
<td>14 (15)</td>
</tr>
<tr>
<td>Previous AMI†</td>
<td>11 (12)</td>
</tr>
<tr>
<td>Previous revascularization</td>
<td>9 (10)</td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>13 (14)</td>
</tr>
<tr>
<td>Kidney disease</td>
<td>6 (6.5)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>18 (20)</td>
</tr>
<tr>
<td>Previous stroke</td>
<td>6 (6.5)</td>
</tr>
<tr>
<td>STEMI‡</td>
<td>54 (59)</td>
</tr>
</tbody>
</table>

* LVEF = Left Ventricular Ejection Fraction; † AMI = Acute Myocardial Infarction; ‡ STEMI = ST-elevation Myocardial Infarction
### Table 2. Echocardiographic parameters

<table>
<thead>
<tr>
<th>ECHO §</th>
<th>Definition</th>
<th>Time after AMI* (mean±SD)</th>
<th>LVEF† (mean±SD)</th>
<th>LV ‡ end-diastolic diameter (cm)</th>
<th>p-value for differences in LVEF compared to ECHO 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHO 1</td>
<td>Clinical echo, determining inclusion</td>
<td>2.1±1.3 days</td>
<td>31±5.8</td>
<td>5.2±0.7</td>
<td></td>
</tr>
<tr>
<td>ECHO 2</td>
<td>First study echo, before discharge</td>
<td>5.0±2.3 days</td>
<td>32±7.0</td>
<td>5.4±0.8</td>
<td>p=0.05</td>
</tr>
<tr>
<td>ECHO 3</td>
<td>Second study echo</td>
<td>1 month</td>
<td>38±11</td>
<td>5.4±0.8</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>ECHO 4</td>
<td>Third study echo</td>
<td>3 months</td>
<td>40±11</td>
<td>5.3±0.6</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

* AMI = Acute Myocardial Infarction; † LVEF = Left Ventricular Ejection Fraction; ‡ LV = Left Ventricular; § ECHO = Echocardiographic examination

### Table 3. Comparison between patients with and without ICD indication at 3 months follow-up.

<table>
<thead>
<tr>
<th></th>
<th>LVEF ≤35% three months after AMI, n (%) n=35</th>
<th>LVEF &gt;35% three months after AMI, n (%) n=51</th>
<th>P-value differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV EF at inclusion (mean ±SD)</td>
<td>28 ± 5.6</td>
<td>34 ± 4.5</td>
<td>0.001</td>
</tr>
<tr>
<td>Age (mean ±SD)</td>
<td>69 ± 9.8</td>
<td>67 ± 11</td>
<td>0.55</td>
</tr>
<tr>
<td>Gender (%male)</td>
<td>29 (83)</td>
<td>39 (76)</td>
<td>0.59</td>
</tr>
<tr>
<td>Previous heart failure</td>
<td>9 (26)</td>
<td>4 (8)</td>
<td>0.03</td>
</tr>
<tr>
<td>Previous AMI</td>
<td>7 (20)</td>
<td>4 (8)</td>
<td>0.11</td>
</tr>
<tr>
<td>STEMI‡</td>
<td>18 (51)</td>
<td>32 (64)</td>
<td>0.49</td>
</tr>
<tr>
<td>Main stem stenosis</td>
<td>4 (11)</td>
<td>3 (6)</td>
<td>0.43</td>
</tr>
<tr>
<td>Three vessel disease</td>
<td>7 (20)</td>
<td>4 (8)</td>
<td>0.11</td>
</tr>
<tr>
<td>Stenosis in left anterior descending artery</td>
<td>18 (51)</td>
<td>34 (67)</td>
<td>1.0</td>
</tr>
<tr>
<td>Revascularization CABG /PCI</td>
<td>30 (86)</td>
<td>49 (96)</td>
<td>0.11</td>
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<tr>
<td>Diabetes</td>
<td>7 (20)</td>
<td>8 (16)</td>
<td>0.77</td>
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<tr>
<td>Atrial fibrillation</td>
<td>6 (18)</td>
<td>6 (12)</td>
<td>0.54</td>
</tr>
<tr>
<td>Smoking</td>
<td>12 (33)</td>
<td>12 (24)</td>
<td>0.47</td>
</tr>
<tr>
<td>Hypertension</td>
<td>19 (54)</td>
<td>22 (43)</td>
<td>0.38</td>
</tr>
<tr>
<td>Beta-blocker therapy</td>
<td>34 (97)</td>
<td>51 (100)</td>
<td>0.48</td>
</tr>
<tr>
<td>ACE-inhibitor or Angiotensin blocker therapy</td>
<td>34 (97)</td>
<td>51 (100)</td>
<td>0.48</td>
</tr>
<tr>
<td>Spironolacton therapy</td>
<td>9 (26)</td>
<td>9 (18)</td>
<td>0.26</td>
</tr>
</tbody>
</table>

* LVEF = Left Ventricular Ejection Fraction; † AMI = Acute Myocardial Infarction; ‡ STEMI = ST-elevation Myocardial Infarction
### Table 4. Comparison between patients with and without ventricular arrhythmias

<table>
<thead>
<tr>
<th></th>
<th>Patients with no ventricular arrhythmia n (%) n=82</th>
<th>Patients with Ventricular arrhythmia n (%) n=9</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>LVEF* at inclusion (mean ±SD)</td>
<td>32 ±10</td>
<td>31 ±5</td>
<td>0.69</td>
</tr>
<tr>
<td>Age (mean ±SD)</td>
<td>68 ±11</td>
<td>71 ±5</td>
<td>0.19</td>
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<tr>
<td>Gender (%male)</td>
<td>62 (76)</td>
<td>9 (100)</td>
<td>0.19</td>
</tr>
<tr>
<td>Previous heart failure</td>
<td>13 (16)</td>
<td>1 (11)</td>
<td>0.70</td>
</tr>
<tr>
<td>Previous AMI†</td>
<td>8 (10)</td>
<td>3 (33)</td>
<td>0.08</td>
</tr>
<tr>
<td>Main stem stenosis</td>
<td>7 (8)</td>
<td>0</td>
<td>0.35</td>
</tr>
<tr>
<td>Three vessel disease</td>
<td>12 (15)</td>
<td>1 (11)</td>
<td>0.73</td>
</tr>
<tr>
<td>Stenosis in left anterior</td>
<td>62 (76)</td>
<td>8 (89)</td>
<td>0.31</td>
</tr>
<tr>
<td>descending artery</td>
<td></td>
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<tr>
<td>Diabetes</td>
<td>16 (20)</td>
<td>2 (22)</td>
<td>0.94</td>
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<tr>
<td>Atrial fibrillation</td>
<td>12 (15)</td>
<td>1 (11)</td>
<td>0.76</td>
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<tr>
<td>Smoking</td>
<td>23 (28)</td>
<td>2 (22)</td>
<td>0.89</td>
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<tr>
<td>Hypertension</td>
<td>37 (45)</td>
<td>6 (67)</td>
<td>0.29</td>
</tr>
<tr>
<td>Beta-blocker therapy</td>
<td>81 (99)</td>
<td>9 (100)</td>
<td></td>
</tr>
<tr>
<td>ACE‡-inhibitor or Angiotensin</td>
<td>82 (100)</td>
<td>8 (89)</td>
<td></td>
</tr>
<tr>
<td>receptor blocker therapy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spironolacton therapy</td>
<td>13 (16)</td>
<td>2 (22)</td>
<td>0.44</td>
</tr>
</tbody>
</table>

* LVEF = Left Ventricular Ejection Fraction; † AMI = Acute Myocardial Infarction; ‡ ACE = Angiotensin Converting Enzyme

### Figure Legends:

**Figure 1.** Type of acute myocardial infarction (AMI) and revascularization. Two patients did both Percutaneous Coronary Intervention (PCI) and Coronary Artery Bypass Surgery (CABG).

**Figure 2.**

A. Left Ventricular Ejection Fraction (LVEF) at inclusion, one month and three months after AMI among the patients who did not meet the criteria for ICD after three months (n=51).

B. Left Ventricular Ejection Fraction (LVEF) at inclusion, one month and three months after AMI among the patients who did meet the criteria for ICD after three months (n=35).
Figure 1
Figure 2A
Figure 2B
Evolution of Left Ventricular Ejection Fraction After Acute Myocardial Infarction: Implications for Implantable Defibrillator Eligibility
Johanna Sjöblom, Josephine Muhrbeck, Nils Witt, Mahbubul Alam and Viveka Frykman-Kull

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