



# Epicardial Cardioverter-Defibrillator Implantation Concomitant with Coronary Artery Bypass in Patients with Low Ejection Fraction

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## ABSTRACT

Patients with severe left ventricular failure are directed to surgical revascularization owing to possibilities of improved survival and the associated postoperative functional status. However, when a postoperative ejection fraction > 35% is unlikely, patients are still at increased risk for sudden cardiac death due to malignant arrhythmias. We documented our results in patients with an ejection fraction < 35% who were concomitantly implanted with a cardioverter-defibrillator by surgical revascularization. We believe that simultaneous surgery is advantageous in terms of preventing sudden cardiac death in the early postoperative period and that it lacks necessity for further intervention.

**Key Words:** Heart failure; coronary artery bypass; defibrillators, implantable; death, sudden, cardiac

## Düşük Ejeksiyon Fraksiyonlu Hastalarda Koroner Baypas Cerrahisi ile Eş zamanlı Epikardiyal Kardiyoverter-Defibrilatör İmplantasyonu

### ÖZET

Ciddi sol ventrikül disfonksiyonu olan hastalar postoperatif artmış yaşam süresi ve düzelmiş fonksiyonel durum sebebiyle cerrahi revaskülarizasyona yönlendirilmektedir. Ancak, eğer postoperatif ejeksiyon fraksiyonu > %35 olacak gibi değilse, hastalar halen malign aritmiler sebebiyle ani kardiyak ölüm için risk altındadır. Biz burada ejeksiyon fraksiyonu < %35 olan, cerrahi revaskülarizasyon ile eş zamanlı kardiyoverter-defibrilatör implantasyonu yapılan hasta sonuçlarımızı dökümanete ettik. Biz bu hastalarda erken postoperatif dönemde ani kardiyak ölümün önlenmesi ve ikinci girişime ihtiyaç olmaması sebebiyle simültane cerrahinin avantajlı olduğunu düşünüyoruz.

**Anahtar Kelimeler:** Kalp yetmezliği; koroner arter baypas; implante edilebilir defibrilatör; ani kardiyak ölüm

## INTRODUCTION

With the advent of surgical revascularization techniques, innovative pharmacologic strategies, and anesthesia, the number of patients undergoing surgical revascularization with severe left ventricular failure has increased and their outcomes have improved, thereby causing a decrease in the performance of available operative risk scores<sup>(1)</sup>. However, mortality is still higher compared with that of normal left ventricular ejection fraction (LVEF) patients. An analysis comprising 700.000 patients enrolled in the STS Adult Cardiac Surgery Database concluded that a 10% decrease in LVEF resulted in a 19% increase in the odds of death<sup>(2)</sup>. Surgery improves survival and patients' functional status, controls ischemic symptoms, and decreases the occurrence of sudden cardiac death (SCD) due to malignant arrhythmias<sup>(3)</sup>. Apart from the well-known perioperative low cardiac output syndrome (LCOS), which is the main determinant of perioperative mortality, survivors are still at an increased risk for SCD caused by malignant arrhythmias and therefore benefit from implantable cardioverter-defibrillator (ICD) therapy<sup>(1,3,4)</sup>.

In this study, we aimed to share our results on 4 patients with an LVEF < 35% (who are eligible for ICD implantation) undergoing CABG surgery concomitant with ICD implantation; we also describe the rationale behind this approach.

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## CASE REPORT

Four patients with an LVEF < 35% were operated, and epicardial dual-chamber ICD implantation (Medtronic, Minneapolis, MN, USA) concomitant with CABG was performed. The mean patient age was  $66.25 \pm 2.5$  (range, 65-75) years. There was only one female patient. The mean LVEF was  $26.25\% \pm 2.5\%$  (range, 25%-30%). The mean number of grafts performed was  $3.5 \pm 1.29$  (range, 2-5). All patients had anginal symptoms, were on guideline-directed medical therapy, and were > 40 days post-MI means all patients had a myocardial infarction 40 or more days ago. Based on echocardiography and myocardial scintigraphy, the cardiology team concluded that none of the patients were likely to have an LVEF > 35% following revascularization. There was one postoperative mortality on day 2 due to LCOS. All patients were weaned from cardiopulmonary bypass with intra-aortic balloon counter pulsation (IABP). The IABP was released after inotropic support was ceased. The main aim was to re-employ inotropic support if the hemodynamic parameters were not satisfactory after IABP cessation. The mean IABP time was  $24 \pm 5.3$  hours, and the mean follow-up time was  $3.6 \pm 0.6$  (range, 3-4) months. Only one patient experienced VF in the first month postoperatively and survived. The other patients did not experience any attacks of VT or VF on controls. Echocardiography was performed monthly, and none of the patients had an LVEF > 35% ( $30.6\% \pm 1.3\%$ ; range, 30%-32%). There was no ICD-related complication.

## DISCUSSION

The ratio of patients with LVEF < 35% undergoing surgical revascularization comprises > 10% of the total population that has undergone CABG<sup>(1)</sup>. Patients with severe left ventricular failure benefit more from CABG if the symptoms of angina are predominant over those of heart failure. Surgical revascularization preserves the viable myocardium, prevents further deterioration, and improves hibernated myocardium<sup>(3)</sup>. Despite the increased perioperative risk, patients have increased survival rates and improved functional status, revealing benefits overcome increased operative mortality<sup>(1,3)</sup>. The perioperative mortality is predominantly affected by LCOS; this leads to renal failure, respiratory failure, and neurologic complications<sup>(1)</sup>. The most important issue among the survivors is SCD caused by malignant arrhythmias. The incidence of VT/VF varies between 0.415 and 1.4% following CABG<sup>(5)</sup>. The current ACC/AHA guidelines for the management of heart failure recommend ICD implantation in ischemic cardiomyopathy patients with > 40 days post-MI, LVEF  $\leq 35\%$ , and NYHA Class II-III or LVEF <

30% and NYHA I on chronic guideline-directed medical therapy and have > 1 year of expected survival. ICD implantation can be useful for those patients who have undergone revascularization, are qualified for ICD implantation for the prevention of SCD, are unlikely to have an LVEF > 35% after revascularization, and are not within 40 days post-MI<sup>(4)</sup>. We employed ICD implantation concomitant with CABG in 4 patients with an LVEF < 35%. None of the patients were within 40 days post-MI, and the cardiology team reached a consensus that no patient was likely to have an LVEF > 35% after surgical revascularization.

For the primary prevention of SCD, ICD implantation has become the standard first-line therapy and is widely employed<sup>(6)</sup>. However, patients undergoing surgical revascularization are unlikely to have an LVEF > 35% following revascularization, are at increased risk for SCD in the postoperative period; further, the time interval for the decision of percutaneous ICD implantation in such patients is unclear and requires a second intervention. Therefore, we believe that the patients outlined above are eligible for ICD implantation concomitant with CABG to decrease the incidence of SCD. This approach also does not require a second intervention. One patient in our population experienced VF one month postoperatively and survived, and this observation supports our approach. However, further randomized controlled trials should be designed to document the objective benefits of this approach.

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