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INTRACORONARY ELECTROCARDIOGRAM-GUIDED STRATEGY FOR THE TREATMENT OF CORONARY BIFURCATION LESIONS – EFFECT ON MORTALITY¹⁴

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Abstract: *Revascularization of bifurcation lesions remains an interventional challenge. The current study aimed to evaluate the influence of intracoronary ECG-guided revascularization strategy on the clinical outcomes of patients after coronary bifurcation stenting compared to the currently accepted standard of care. Patients with coronary bifurcation lesions who underwent percutaneous revascularization were enrolled in a prospective all-comers' registry, and a comparison between patients who underwent intracoronary ECG-guided revascularization and those treated with a provisional T-stenting strategy was made. A total of 768 were included in the analysis - 349 patients underwent icECG-guided strategy and 419 – PTS. The overall all-cause death was 23.2% and cardiovascular death was 15.9%. Patients with icECG guidance had significantly lower all-cause and cardiovascular mortality – icECG vs PTS: all-cause mortality – 20.3% vs. 25.5%, log-rank $p=0.006$; cardiovascular mortality – 12.6% vs. 18.6%, log-rank $p=0.004$. The effect of decreased mortality was most pronounced in patients with no or moderate increase of troponin post-PCI as well as those with higher-than-normal baseline concentrations. Intracoronary ECG-guided strategy for coronary bifurcation PCI led to a decreased patient mortality when compared to the provisional T-stenting strategy. This effect was most pronounced in patients with no or moderate increase of troponin post-PCI as well as in those with higher-than-normal baseline concentrations.*

Keywords: *Coronary bifurcation, Percutaneous coronary intervention, Clinical outcomes*

JEL Codes: *L10, L11*

INTRODUCTION

Revascularization of bifurcation lesions remains a challenge both in terms of procedural success and long-term cardiovascular outcomes (Grundeken, MJ., 2016). In the last years, there has been a significant improvement in the percutaneous treatment of coronary bifurcation stenosis (Lee, DH., 2018). The introduction of kissing balloon inflation (KBI), and proximal optimization technique (POT) have significantly improved patient clinical outcomes (Hakim, D., 2017). Additionally, it has been previously shown that a strategy using intracoronary electrocardiogram

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(icECG) guidance may be useful to predict the functional significance of side branch (SB) stenosis after bifurcation stenting (Vassilev, D., 2022). We have demonstrated, that icECG is able to predict post-procedural rise in troponin after coronary bifurcation lesions stenting (Vassilev, D., 2016). Moreover, icECG have a unique ability to locate possible source of post PCI rise in troponin, detecting the zones with ST-segment elevation on icECG at the end of procedure (Chevalier, B., 2021). However, to the best of our knowledge an analysis of the influence of icECG-guidance for bifurcation PCI on all-cause and cardiovascular mortality has not been performed until now.

EXPOSITION

Patient selection

From July 2017 to December 2020 all patients with coronary bifurcation stenoses were included in a prospective registry. For the current analysis, patients with left main stenosis, ST-elevation myocardial infarction, life expectancy of less than 12 months were excluded. Also, patients with in-hospital events were excluded. No other restrictions for patient inclusion were adopted.

Definition of endpoints

Patients were followed up for vital status through the national social security system at every 3 months. In case a patient deceased, the relatives were contacted for additional information on the reason of death. Outcomes were defined according to the current recommendations (Lunardi, M., 2022).

Demographic and procedural characteristics

From 1042 patients that underwent coronary bifurcation stenting, 768 were included in the current analysis. 349 patients underwent icECG-guided strategy and 419 – underwent standard of care. The two groups had similar risk profiles. The icECG-guided group had significantly more smokers (54% vs 34%, $p = 0.001$), more previous myocardial infarctions, but lower rate of chronic kidney disease (GFR – icECG group 78 ± 26 ml/kg/min vs. 71 ± 23 ml/kg/min, $p < 0.001$). Furthermore, the rate of atrial fibrillation was slightly lower in the icECG-guided group 18% vs 24%, $p = 0.024$, respectively. Interestingly, the patients with icECG guidance received less frequently statins (93% vs 98%, $p = 0.001$) and more frequently clopidogrel (88% vs. 82%, $p = 0.019$).

We specifically evaluated the differences in patient symptoms, left ventricular function and mitral regurgitation between the two groups. There was no difference regarding angina (median CCS class 3, IQR – 2 – 4), but more patients had dyspnea in PTS group (NYHA class II-III: 13% vs. 22%, icECG vs. PTS, $p = .001$). Patients with icECG guidance had better left ventricular ejection fraction (LV EF) ($57 \pm 8\%$ vs. $55 \pm 10\%$, $p = 0.009$) and lower rates of significant mitral regurgitation (14% vs. 23%, $p = 0.001$).

Periprocedural troponin dynamics

We specifically explored the periprocedural troponin dynamics. Twenty-eight % of the patients in the icECG-guided group had a post-PCI troponin increase $\geq 5 \times$ UNL, compared to 37.5% of the patients in the SoC group ($p = 0.009$). There was also a significantly less increase in troponin post-PCI – 77% in icECG group vs. 82% in SoC group ($p = 0.046$). There was no difference in the frequency of periprocedural myocardial infarctions between groups ($p = 0.582$).

Clinical outcomes

The median follow-up time was 56 months (IQR 38-60 months). The all-cause mortality was 23.2% (178/768) and cardiovascular mortality was 15.9% (122/768). The type of interventional strategy had a significant impact on the survival – patients with icECG guidance had significantly lower all-cause and cardiovascular mortality – icECG vs PTS: all-cause mortality – 20.3% vs. 25.5%, log-rank $p = 0.006$; cardiovascular mortality – 12.6% vs. 18.6% (log-rank $p = 0.004$, figure 1).

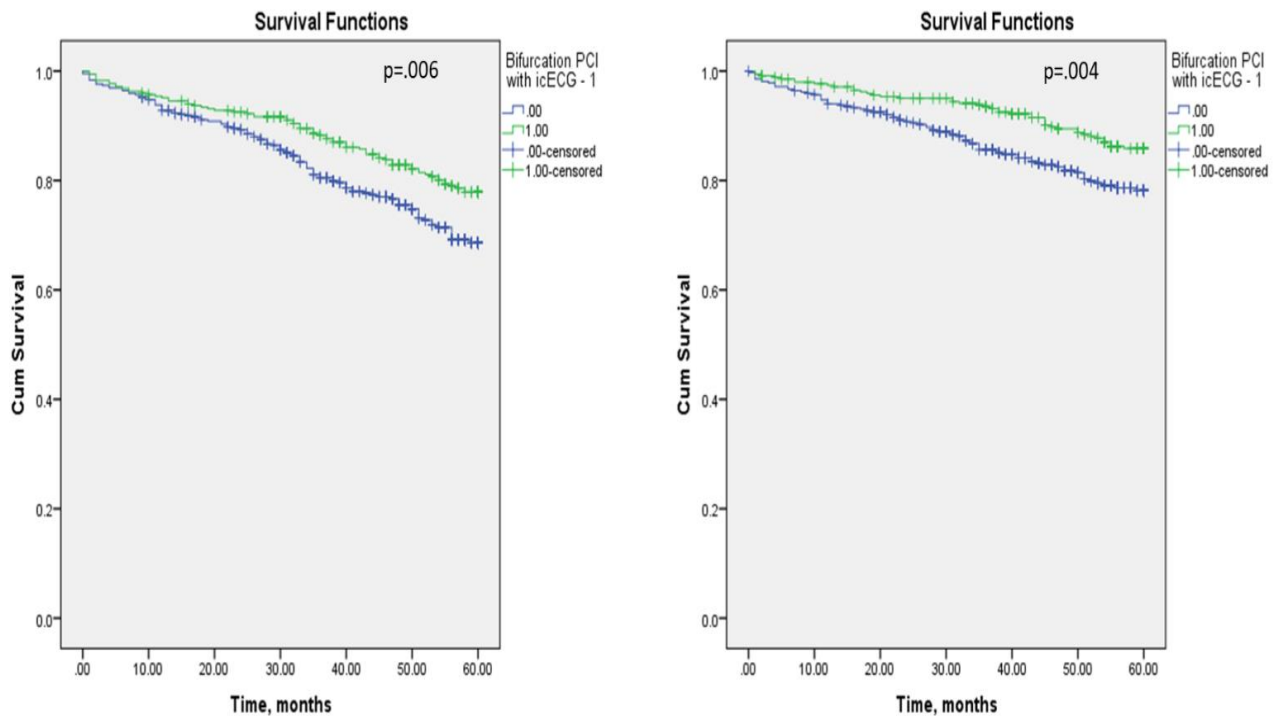


Figure 1. Kaplan-Meier survival curves of events – green line indicates icECG guided group, blue line – provisional T-stenting group. A) All-cause mortality; B) Cardiovascular mortality

As there was a strong association between icECG guidance and troponin dynamics we analyzed the effect of this strategy in 3 different strata of troponin:

- 1) normal vs. increased at baseline;
- 2) more and less than 5 x UNL post PCI;
- 3) those with and without increase post PCI.

As seen from Kaplan-Meier curves demonstrated on figure 2 and 3 the icECG guidance had a significant effect on patient survival, especially in patients with increased baseline troponin, those with myocardial injury (a troponin increases post-PCI, not reaching the cut-off value for periprocedural infarction) and those without change in baseline troponin. However, even in the remaining groups, the icECG-guided group had numerically better survival.

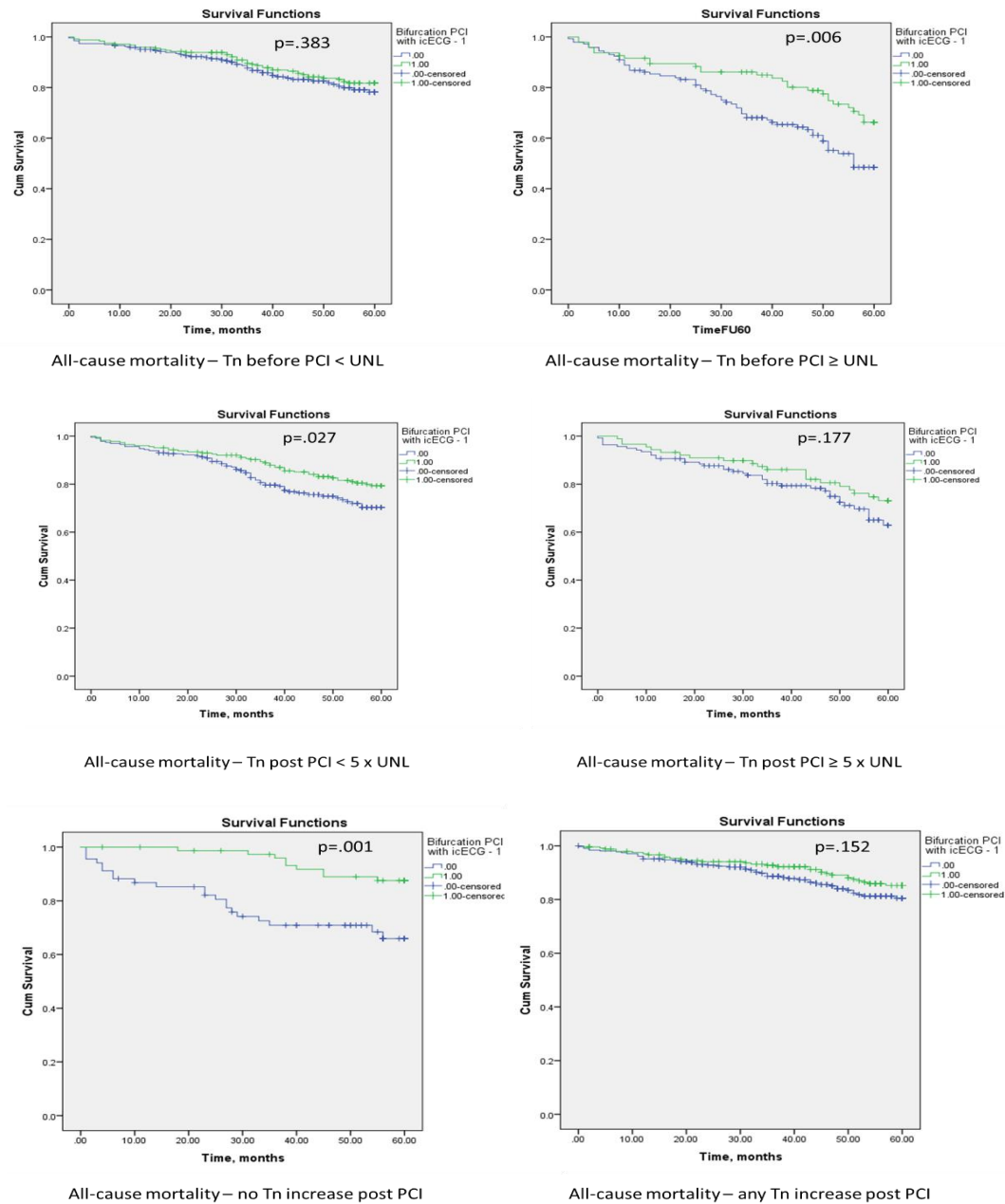


Figure 2. Survival curves for icECG guided strategy of bifurcation stenting vs. SoC in different strata of troponin dynamics – all-cause death. Green line indicates icECG guided group, blue line – provisional T-stenting group.

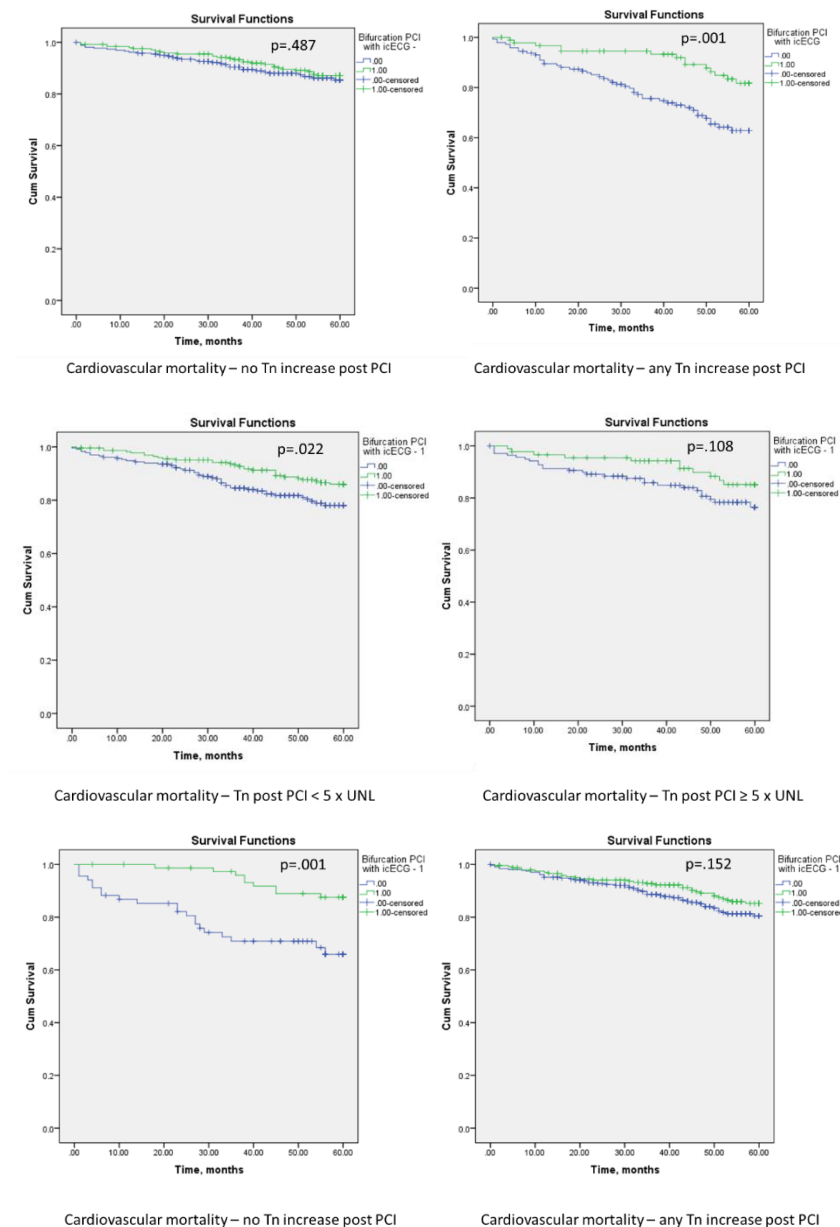


Figure 3 – survival curves for icECG guided strategy of bifurcation stenting vs. SoCin different strata of troponin dynamics – cardiovascular death

CONCLUSION

Intracoronary ECG-guided strategy for coronary bifurcation PCI led to a decreased patient's mortality when compared to the standard of care. This effect was most pronounced in patients with no or moderate increase of troponin post-PCI as well as in those with larger than normal baseline concentrations.

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