ORIGINAL ARTICLE

Percutaneous coronary intervention for left main coronary artery. Temporal trends and long-term outcomes from the all-comer BIA-LM registry

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DOI: 10.33963/v.phj.102774

Received:
July 15, 2024

Accepted:
September 23, 2024

Early publication date:
October 2, 2024

ABSTRACT

Background: Percutaneous coronary intervention (PCI) for the left main coronary artery (LMCA) was endorsed by trials.

Aims: This article aimed to assess prognosis and temporal trends in a real-world registry.

Methods: In total, 998 patients undergoing LMCA PCI were hospitalized from December 27, 2007 to February 21, 2022. The analysis included mortality predictors, annual and periodic trends assessments (2007–2014 compared to 2015–2022).

Results: The median age of patients was 71 years (interquartile range 16); 736 (73.8%) were male, and 448 (51.9%) had multimorbidity (≥3 chronic diseases). Worse prognosis was associated with age ≥75 years (hazard ratio [HR], 1.61; 95% confidence interval [CI], 1.17–2.20; P = 0.003), myocardial infarction (HR, 1.47; 95% CI, 1.06–2.04; P = 0.02), previous myocardial infarction (HR, 1.43; 95% CI, 1.07–1.91; P = 0.02), diabetes (HR, 1.38; 95% CI, 1.03–1.84; P = 0.03), atrial fibrillation (HR, 1.74; 95% CI, 1.26–2.39; P = 0.001), chronic obstructive pulmonary disease (HR, 2.01; 95% CI, 1.27–3.20; P = 0.003), and previous stroke (HR, 1.78; 95% CI, 1.17–2.70; P = 0.007). Higher ejection fraction (HR, 0.98; 95% CI, 0.96–0.99; P <0.001 for 1% increase) and intravascular imaging (HR, 0.70; 95% CI, 0.49–1.00; P = 0.047) yielded better outcomes. The rate of LMCA PCI increased from 2.2% in 2008 to 6.9% in 2021 (P <0.001). There were increases in annual and periodic multimorbidity rates (P <0.001), intravascular imaging (P <0.001), and decreases in 30-, 90-day (log-rank P <0.001) and 1-year mortality (log-rank P = 0.007). Six-year landmark mortality analysis at 30 days showed a trend toward worse prognosis in patients hospitalized in the late period (log-rank P = 0.051).

Conclusions: PCI and multimorbidity rates increased. Short-term mortality decreased, while prognosis beyond 30 days worsened. Advancements in PCI technology may improve early outcomes; however, efforts should be made to reduce multimorbidity burden.

Key words: coronary artery disease, percutaneous coronary interventions, revascularization

INTRODUCTION

Patients with significant left main coronary artery (LMCA) stenoses are known to have an elevated risk of death owing to the large area of the jeopardized myocardium [1]. Historically, coronary artery bypass grafting (CABG) has been considered as a treatment of choice for LMCA disease. Recent years brought evidence that led to the reconsideration of percutaneous coronary intervention (PCI) in selected subgroups as a less invasive yet equally effective revascularization alternative, which was reflected by changes in the American College of Cardiology/American Heart Association Society for Cardiovascular Angiography and Interventions and European Society of Cardiology/European Association for Cardio-Thoracic Surgery recommendations [2, 3].

Despite extending the guidelines, the optimal percutaneous approach has not been elucidated yet and is a matter of ongoing debate. Although studies investigating LMCA PCI often provided conflicting results,

WHAT'S NEW?

The majority of patients referred for percutaneous coronary intervention have distal left main coronary artery disease, ≥3 comorbidities, and are over 70 years old. In fourteen years of follow-up, there was a significant increase in rates of left main coronary artery percutaneous coronary interventions and multimorbidity. Early survival improved, but alarmingly, there was a trend toward worse prognosis in 6-year follow-up beyond 30 days after the procedure. Advancements in percutaneous device technology and procedural techniques may be associated with more favorable outcomes. However, further efforts should be made to reduce the burden of multimorbidity in aging societies.

they made it evident that outcomes may vary depending on the stent generation, implementation of adjunctive tools, such as intravascular imaging and physiological assessment, procedural technique, and antithrombotic regimen [4]. Current recommendations were based on the data from randomized clinical trials (RCTs). However, the strictly-selected enrolled population may not fully reflect everyday practice, which was recently underlined in the SWEDEHEART registry analysis [5–8].

Finally, time-related changes regarding percutaneous procedural volumes, outcomes, using new technologies, and peri-procedural complications remain unknown. In the aging society, patients tend to have more comorbidities, chronic diseases, and previous procedures, which poses new challenges for operators and physicians. Whether this may influence outcomes of revascularization needs to be investigated, especially in the light of a recently published joint European Society of Cardiology/European Association for Cardio-Toracic Surgery review of revascularization guidelines, suggesting a downgrade from class I to IIa for patients with LMCA disease and low SYNTAX scores [9]. Thus, our study aimed to assess real-world temporal trends in clinical practice, rates of comorbidities, and long-term prognosis in patients undergoing LMCA angioplasty in a large all-comer registry from a high-volume center in Poland.

METHODS

Study population

The study included data collected retrospectively from the BIA-LM registry. The database is a single-center all-comer registry of percutaneous LMCA revascularization procedures performed in the Department of Invasive Cardiology, Medical University of Białystok, Poland. Initially, the database consisted of 57 969 medical records of patients hospitalized in the Department of Invasive Cardiology and patients referred for invasive treatment from the Department of Cardiology, Department of Cardiac Surgery, Department of Emergency Medicine, and Department of Anesthesiology and Intensive Care from December 27, 2007 to February 21, 2022, of whom 2973 were diagnosed with significant LMCA stenoses. After exclusion of duplicates, patients referred for coronary artery bypass grafting or conservative treatment, 998 patients undergoing PCI LMCA were included. The study flowchart is presented in Figure 1.

The study was approved by the Bioethics Committee of the Medical University of Bialystok, Poland (approval no. APK.002.78.2022), adhered to the 2013 Helsinki Declaration and the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) guidelines (Supplementary material, *Table S1*) to ensure transparency and reproducibility of the results.

Outcomes and definitions

The study included all patients undergoing PCI LMCA for any reason. The analyzed variables included age ≥75 years, sex, acute myocardial infarction (MI) (non-ST-segment elevation MI or ST-segment elevation MI), atrial fibrillation (AF), glomerular filtration rate categories according to KDIGO (Kidney Disease Improving Global Outcomes) classification, dialysis, chronic obstructive pulmonary disease (COPD), diabetes mellitus (DM) and insulin-dependent DM, heart failure (HF), hypertension, peripheral arterial disease (PAD), and selected procedural details. Detailed definitions of comorbidities are described in the Supplementary material, section on *Methods*.

The primary analyzed endpoint was survival at the longest available follow-up. Mortality data for all patients were obtained from the Centre for Information Technology, Ministry of Digital Affairs, Poland, and was valid on June 13, 2022.

Secondary analyses included changes in patients' characteristics and survival, calculated for annual, chronological, and equal periodic trends. The early period, defined as the years 2007–2014, was compared to the late period —2015–2022.

Statistical analysis

Baseline characteristics were described as numbers (n) of occurrence and frequencies (%) for categorical variables and mean with standard deviation for continuous variables if normally distributed. Non-normal distributions were summarized as medians and interquartile ranges. Categorical variables were compared using the χ^2 test or Fisher's exact test in cases when the expected count of the variable was <5. Continuous variables were compared with Student's t-test or the Wilcoxon rank-sum test.

Annual trends were calculated using Kendall's tau (τ) for a calendar year as a categorical variable and frequencies of occurrence in the annual number of patients as an outcome variable. The frequency of LMCA PCI was calculated by

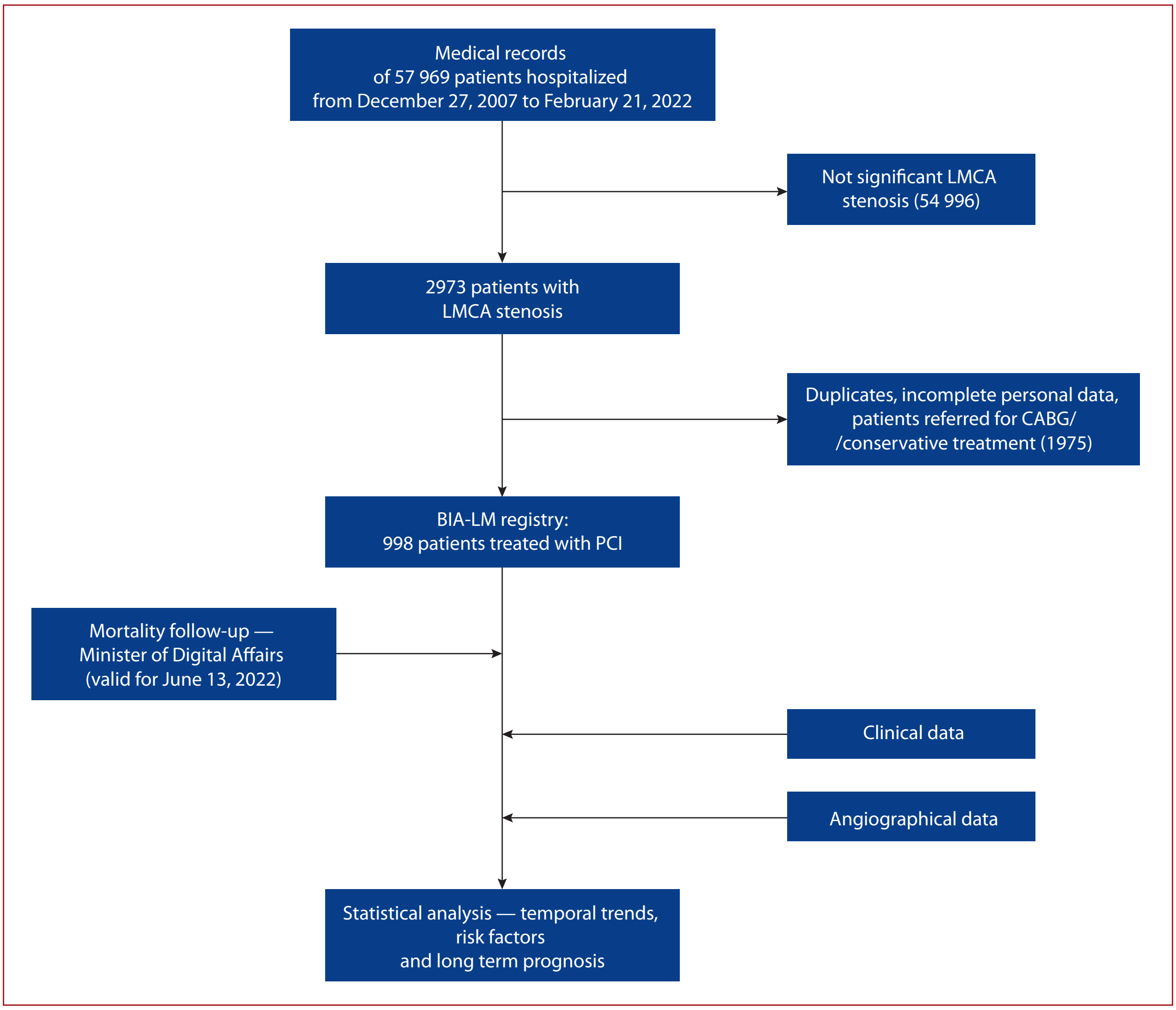

Figure 1. Flowchart of the study.

Abbreviations: CABG, coronary artery bypass grafting; LMCA, left main coronary artery; PCI, percutaneous coronary intervention

comparing the number of LMCA PCIs to the total number of PCIs performed in the department during the calendar year.

Survival was assessed using the Kaplan-Meier failure rate in time-to-event analysis and compared with the log-rank test. Outcome predictors were assessed using multivariable Cox proportional hazard regression models. All of the variables with *P*-values <0.1 in the univariate analysis and those of potential clinical importance were considered for inclusion in the final model. The proportionality assumption of the Cox model was assessed using Schoenfeld residuals (Supplementary material, *Table S2*). Multicollinearity was analyzed using a correlation matrix of coefficients of the Cox model with values >0.4, indicating significant multicollinearity (Supplementary material, *Table S3*). The results of Cox regression are presented as a hazard ratio with a 95% confidence interval. No imputation methods were used to infer missing values of baseline variables. For all analyses, the level of statistical significance was set at *P* <0.05.

RESULTS

Baseline characteristics

The summary of baseline characteristics is presented in Table 1. The median age of the analyzed population was 71 years old (interquartile range 16), and 736 (73.8%) were male. Chronic coronary syndrome was an indication for PCI in 545 (57.1%) patients and acute coronary syndrome (ACS) in 409 (42.9%).

The radial approach was chosen in 776 (77.8%) cases, and 865 (86.8%) patients received drug-eluting stents. Distal LMCA PCI was performed in 867 (86.9%) cases, 353 (35.4%) procedures involved intravascular imaging, and 151 (15.1%) rotational atherectomy. Provisional stenting was applied in 815 (82.9%) patients. Patients undergoing intravascular imaging-guided PCI had significantly larger stent and balloon diameters, had higher maximal pressures used during the procedure, and more frequently had post-dilation and proximal optimization. Detailed angi-

Table 1. Baseline characteristics

Variable	Overall population	Early period (2007–2014)	Late period (2015–2022)	*P*–value
Number of PCIs	998 (100%)	358 (35.9%)	640 (64.1%)	<0.001
Baseline data				
Male	736 (73.8%)	263 (73.5%)	473 (74%)	0.85
Age, years	71 (63–79)	70 (59–77)	71 (64–80)	0.002
Age ≥75	393 (39.4%)	136 (38%)	257 (40.2%)	0.50
Age ≥65	699 (70.4%)	230 (64.3%)	469 (73.3%)	0.003
BMI, kg/m^2	27.8 (24.9–31.2)	27.6 (24.8–30.8)	27.9 (25–31.4)	0.22
Medical history				
Diabetes	325 (34.9%)	87 (27.5%)	238 (38.8%)	0.001
IDDM	72 (7.8%)	10 (3.2%)	62 (10.2%)	<0.001
Hypertension	791 (85.2%)	251 (79.4%)	540 (88.2%)	<0.001
Hypercholesterolemia	833 (89.8%)	261 (82.6%)	572 (93.5%)	<0.001
AF	215 (23.4%)	65 (20.6%)	150 (24.9%)	0.14
KDIGO stage ≥G3a	298 (32.7%)	96 (31.3%)	202 (33.5%)	0.50
KDIGO stage ≥G3b	128 (14.1%)	41 (13.4%)	87 (14.4%)	0.66
KDIGO stage ≥G4	38 (4.2%)	12 (3.9%)	26 (4.3%)	0.77
Dialysis	11 (1.2%)	2 (0.6%)	9 (1.5%)	0.27
PAD	235 (25.5%)	43 (13.6%)	192 (31.7%)	<0.001
COPD	74 (8%)	22 (7%)	52 (8.6%)	0.38
EF (%)	48 (36–55)	47 (33–55)	48 (38–55)	0.05
Heart failure	525 (55.7%)	141 (44.2%)	384 (61.5%)	<0.001
Severe VHD	44 (5.2%)	16 (6.3%)	28 (4.7%)	0.32
Previous MI	419 (46.5%)	139 (44%)	280 (47.8%)	0.28
Previous stroke	82 (9.5%)	21 (6.6%)	61 (11.2%)	0.03
Previous revascularization	502 (54%)	157 (48.6%)	345 (56.8%)	0.02
Previous PCI	391 (42.7%)	103 (32.1%)	288 (48.4%)	<0.001
Previous CABG	183 (20.7%)	69 (21.7%)	114 (20.1%)	0.58
LIMA graft	150 (17.1%)	52 (16.5%)	98 (17.4%)	0.71
LAD territory graft occlusion	24 (14.4%)	17 (20.2%)	7 (8.2%)	0.03
LCx territory graft occlusion	36 (21.5%)	22 (26.2%)	14 (16.5%)	0.12
Biochemical tests				
Hemoglobin (g/dl)	13.4 (12.2–14.4)	13.5 (12.2–14.4)	13.3 (12.2–14.3)	0.44
Platelets (10^3/µl)	207 (172-254)	205 (170-249)	207 (174-255)	0.42
Creatinine (mg/dl)	0.97 (0.85–1.22)	0.98 (0.84–1.21)	0.97 (0.85–1.22)	0.97
GFR (ml/min/1.73 m^2)	72.1 (54.2–87.3)	73.4 (56.1–88.1)	71.4 (53.7–87.0)	0.32
Clinical presentation				
Chronic coronary syndrome	545 (57.2%)	174 (53.5%)	371 (59.1%)	0.09
ACS	409 (42.9%)	152 (46.6%)	257 (40.9%)	
STEMI	42 (5%)	18 (7.1%)	24 (4.1%)	0.003
NSTEMI	223 (26.6%)	61 (24.1%)	162 (27.6%)	
UA	109 (11.9%)	49 (16.2%)	60 (9.7%)	

P value is presented for the comparison of early and late periods. Values are means (standard deviations), n (%), or medians (interquartile ranges)

Abbreviation: ACS, acute coronary syndrome; AF, atrial fibrillation; BMI, body mass index; CABG, coronary artery bypass grafting; COPD, Chronic Obstructive Pulmonary Disease; EF, ejection fraction; GFR, glomerular filtration rate; IDDM, insulin-dependent diabetes mellitus; KDIGO, Kidney Disease Improving Global Outcomes classification; LAD, left anterior descending artery; LCx, left circumflex artery; LIMA, left internal mammary artery; MI, myocardial infarction; NSTEMI, non-ST-segment elevation myocardial infarction; PAD, peripheral artery disease; PCI, percutaneous coronary intervention; STEMI, ST-segment elevation myocardial infarction; UA, unstable angina; VHD, valvular heart disease

ographic information is provided in the Supplementary material, *Tables S4* and *S5*.

Outcome and multivariable analysis

The follow-up was the maximum available time, and the overall observation time was 1 536 872 days (mean 1540 days [~51 months]), during which 416 (41.7%) patients died, and the median survival time was 2758 days (~92 months). Death at 30-day, 90-day, 1-year, 3-year, 5-year, and 10-year occurred in 64 (6.4%), 79 (7.9%), 144 (15.4%), 236 (29.8%), 310 (47.4%), 400 (84.6%) individuals, respectively. In the landmark analysis at 30 days after PCI (Figure 2), patients hospitalized in the late period had significantly better early survival (log-rank *P* <0.001), with a trend toward worse prognosis in 6-year follow-up beyond 30 days (log-rank *P* = 0.051). Kaplan–Meier survival analyses in selected subgroups of interest are presented in Figure 3.

In the Cox multivariable analysis, death at the longest available follow-up was significantly associated with age ≥75 years, MI on admission, previous MI, DM, AF, COPD, and stroke. Better outcomes were associated with higher left ventricular ejection fraction and use of intravascular

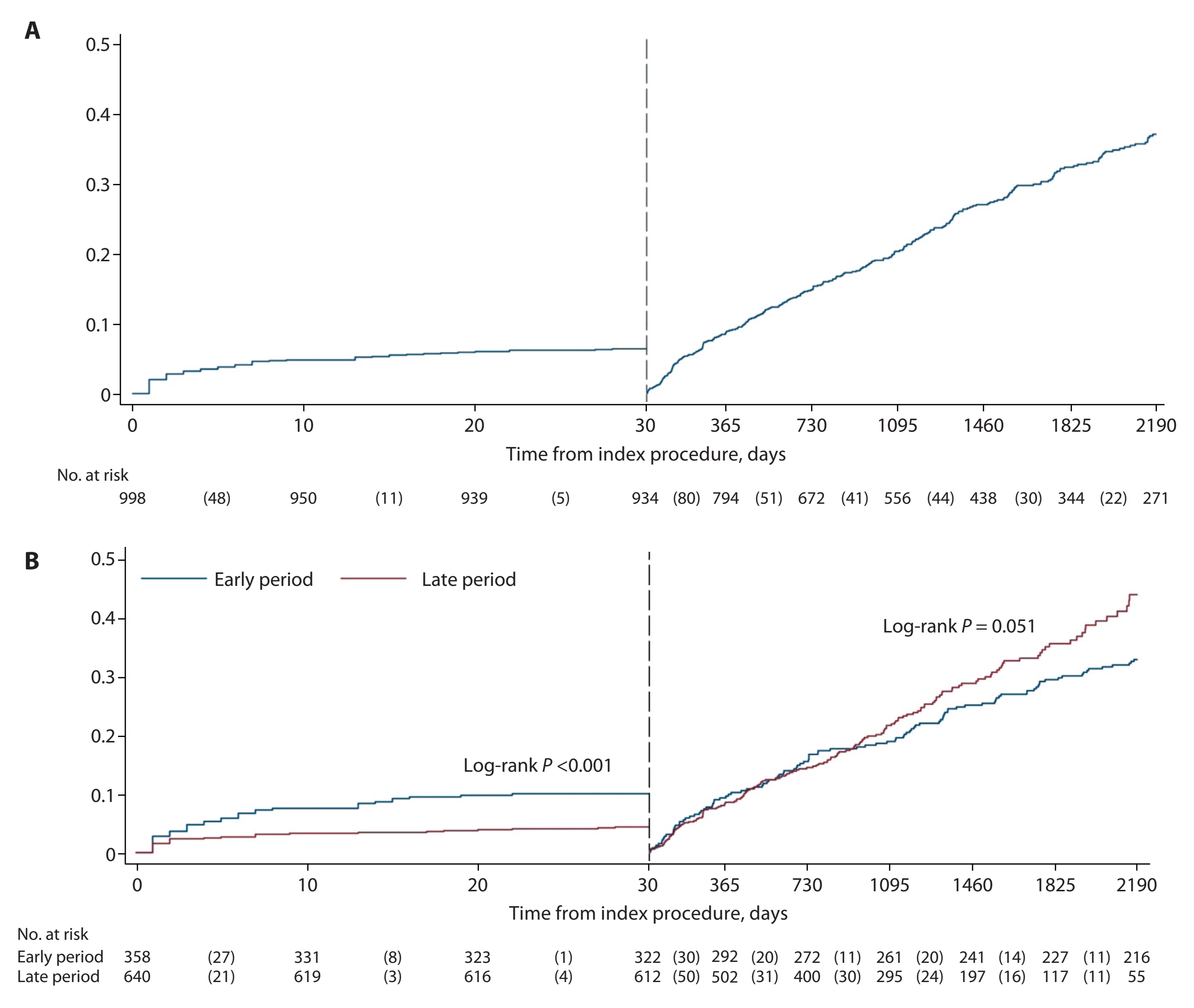

Figure 2. Six-year landmark analyses of mortality rates at 30-days. **A.** In overall population. **B.** In population stratified on two periods — early (2007–2014) and late (2015–2022)

imaging. Detailed results of uni- and multivariable Cox proportional hazard regression are presented in the Supplementary material, *Table S6*.

Temporal trends analysis

During the study period, in the year-to-year analysis, the rate of performed LMCA PCI increased from 2.3% to 6.9% (P <0.001; Figure 4). Moreover, there was a significantly increasing trend in the rates of multimorbidity, MI, concomitant HF, hypertension, AF, DM, PAD, history of previous revascularization, radial access, use of intravascular imaging, and rotational atherectomy. Concurrently, there were significantly decreasing rates of intra-aortic balloon pump (IABP) use, periprocedural GP IIb/IIIa inhibitors administration, 30-day, 90-day, and 1-year mortality. The results of the annual trend analysis are presented in Figure 5.

In the late period, as compared to the early period, there were significantly higher numbers of patients aged ≥65 years and with concomitant DM, PAD, HF, HL, multimorbidity, and a history of previous revascularization. The use of intravascular imaging, rotational atherectomy, and radial access increased, while the rate of GP IIb/IIIa inhibitors administration, IABP, and any complications decreased. Thirty-day, 90-day, and 1-year mortality decreased significantly, with the greatest reductions in ACS patients. Detailed data on periodic trends are presented in Table 1, Figure 6, and Supplementary material, *Table S4*.

DISCUSSION

The main findings of the study (Figure 7) are as follows: 1) there was a 200% increase in the rate of performed LMCA PCIs over the years; 2) over half of the patients suffered from ≥3 chronic diseases besides coronary artery disease (CAD); 3) in analyzed periods, there was an increase in rates of most analyzed comorbidities, with early prognosis improvement and decrease in survival beyond 30-days; 4) use of additional coronary devices emerged increased as a decrease in complication rates and the need for emergency tools was observed; 5) use of intravascular imaging significantly improved prognosis; 6) mortality rates in the

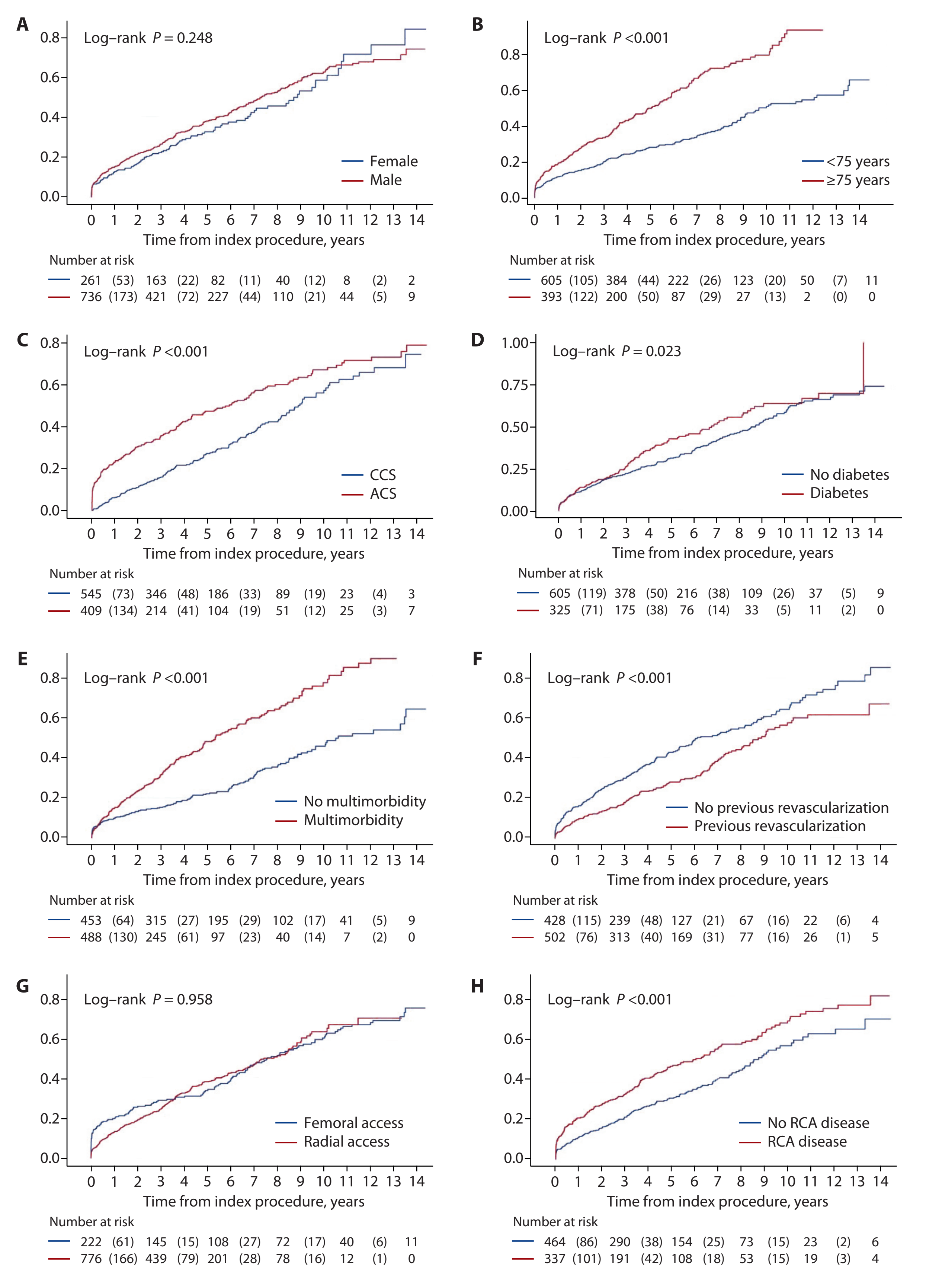

Figure 3. Kaplan–Meier unadjusted mortality estimates for selected subgroups. According to: **A.** Sex. **B.** Age over 75 years. **C.** Clinical presentation. **D.** Concomitant diabetes. **E.** Multimorbidity. **F.** History of previous revascularization. **G.** Vascular approach. **H.** RCA disease

Abbreviations: ACS, acute coronary syndrome; BMS, bare-metal stent; CCS, chronic coronary syndrome; DES, drug-eluting stent; RCA, right coronary artery

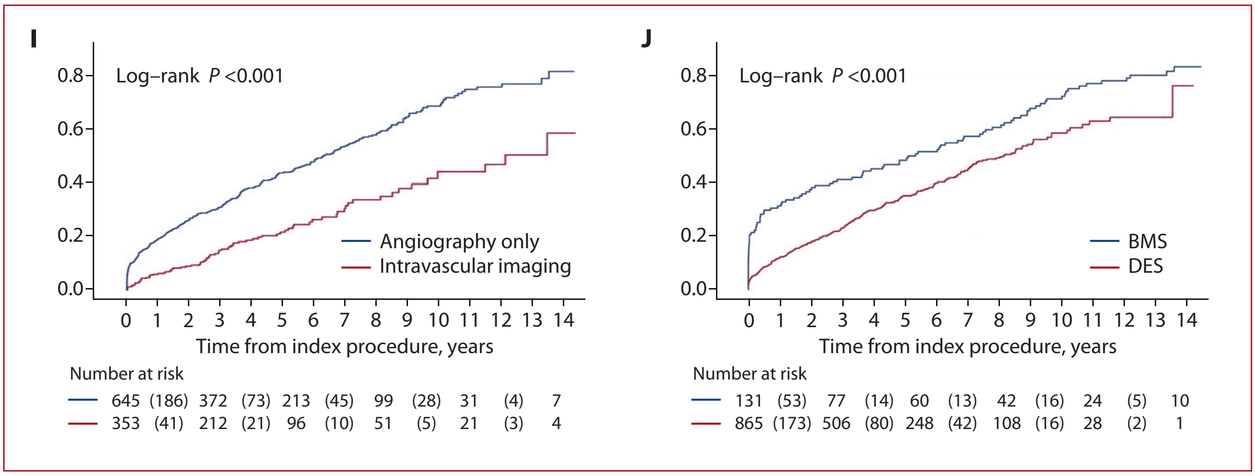

Figure 3 (cont). Kaplan–Meier unadjusted mortality estimates for selected subgroups. According to: **I.** Use of intravascular imaging. **J.** Type of implanted stent

Abbreviations: ACS, acute coronary syndrome; BMS, bare-metal stent; CCS, chronic coronary syndrome; DES, drug-eluting stent; RCA, right coronary artery

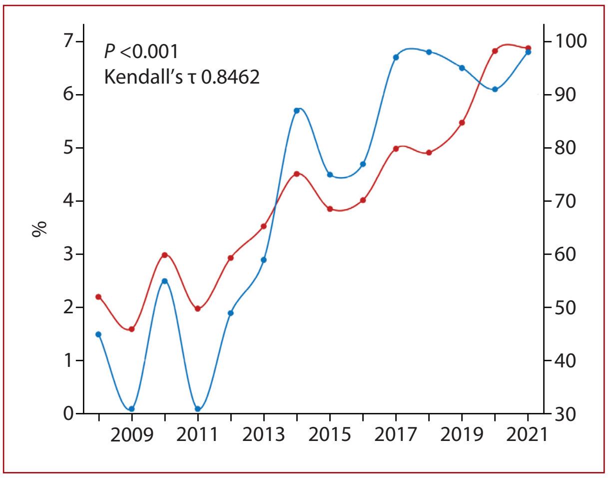

Figure 4. Annual changes in the absolute number and percentage of left main coronary artery angioplasty (LMCA) procedures, compared to the total number of performed procedures. Red line denotes share of LMCA percutaneous coronary intervention (PCI) in relation to total number of PCI. Blue lines denotes absolute number of LMCA PCI

real-world registry are significantly higher than in randomized clinical trials.

Comparison with other studies

Pivotal, guideline-changing RCTs investigating PCI of the LMCA reported encouraging, low mortality rates, ranging from 9% up to 13% in 5-year follow-ups of NOBLE and EXCEL trials [6, 7]. However, noteworthy is the fact that the median age of patients enrolled in most of the studies was 61–66 years old, with low rates of most common comorbidities, which significantly differs from the characteristics of most patients observed in everyday practice [5, 8]. There are few large observational reports investigating the results of LMCA angioplasty and temporal changes. Only several of them provided long-term follow-up, limiting the data on actual real-world outcomes after the extension of revascularization guidelines [5, 10, 11]. Moreover, even less investigated was the impact of comorbidities and a shift in patient profile, which makes our study one of the first to assess multimorbidity.

Temporal trends in clinical practice vary depending on the geographical location and local reimbursement policies. In the study from the NCDR CathPCI registry, investigating patients undergoing PCI in the years 2009–2016, LMCA PCI accounted for only 1% of all procedures, with a modest increase from 0.7% to 1.3% over time [10]. The analysis of the BCIS Database reported an increase in the annual percentage of LCMA PCI, rising from 1.8% in 2009 to 3.4% in 2017 [11]. Mohammad et al., in the pragmatic SCAAR analysis including patients hospitalized in the years 2005–2017, showed a 386% increase in the actual number of performed annual procedures [12]. Notably, the authors assessed 3-year outcomes and reported a 28.2% all-cause mortality rate, which is similar to the 29.8% 3-year mortality rate observed in the BIA-LM registry [12].

The results of our study are in line with previous reports, showing a significant trend for an increase in the rate of performed angioplasties, starting from 2.3% in 2008 and accounting for 6.9% of all PCIs performed in 2021. As compared to data from randomized studies, where up to 76% of all LMCA PCI were intravascular imaging-guided procedures, reports from contemporary registries show significantly lower rates that vary from 38% to 59%, which is consistent with our report [6, 7, 10–12].

Temporal trends and multimorbidity assessment

In our registry, concurrently with the number of procedures, the comorbidity burden increased as well. Not only have we observed rising trends in the rates of concomitant major comorbidities, but also, the number of patients with multimorbidity increased by almost 50% in the late period. Yet, in the corresponding timeframes, use of emergency tools and short-term mortality rates have significantly declined. This may be explained by several plausible mechanisms,

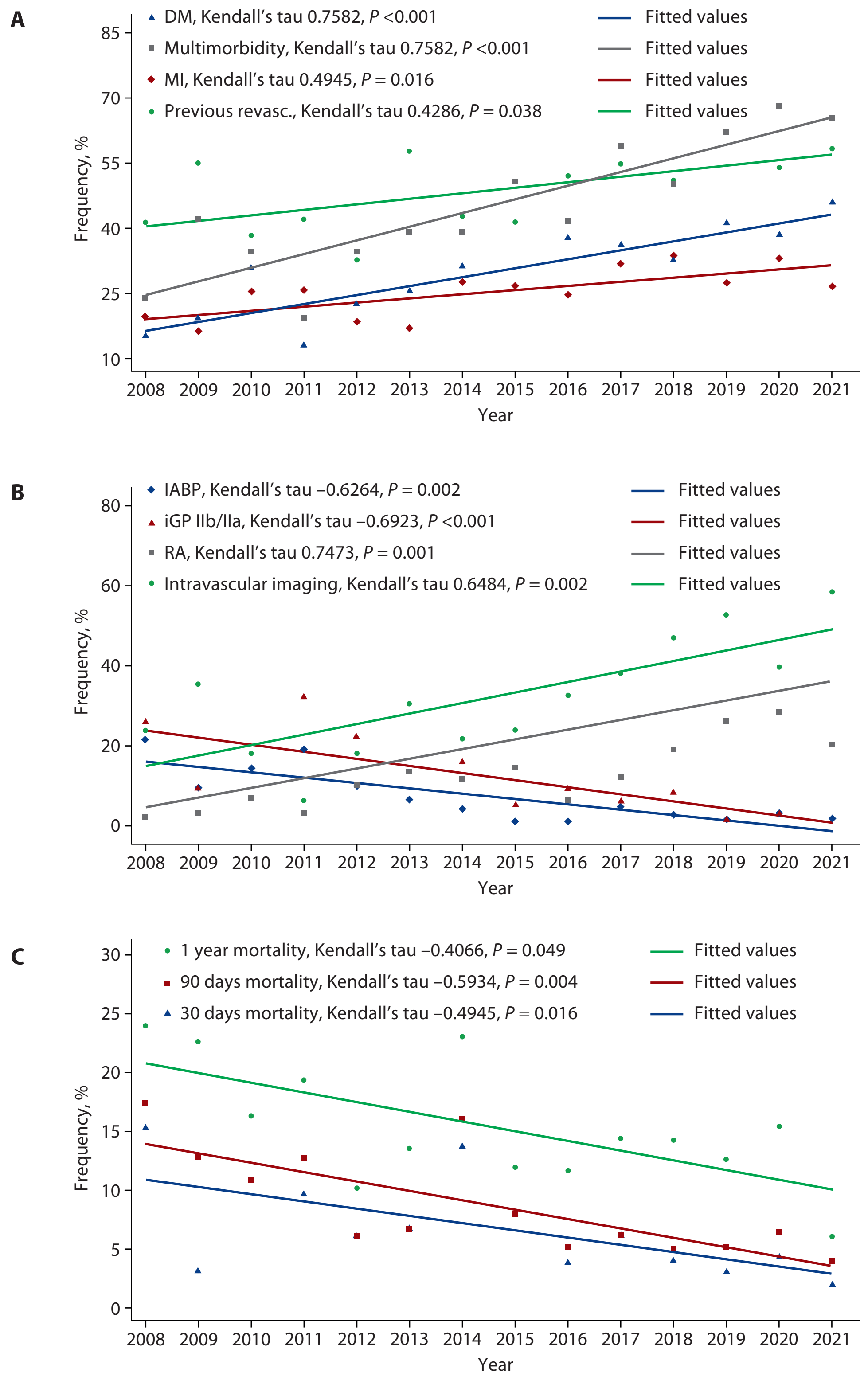

Figure 5. Annual temporal trends for selected variables and outcomes. **A.** Selected morbidity trends. **B.** Selected procedural trends. **C.** Mortality trends

Abbreviations: DM, diabetes mellitus; IABP, intra-aortic balloon pump; MI, myocardial infarction; RA, rotational atherectomy

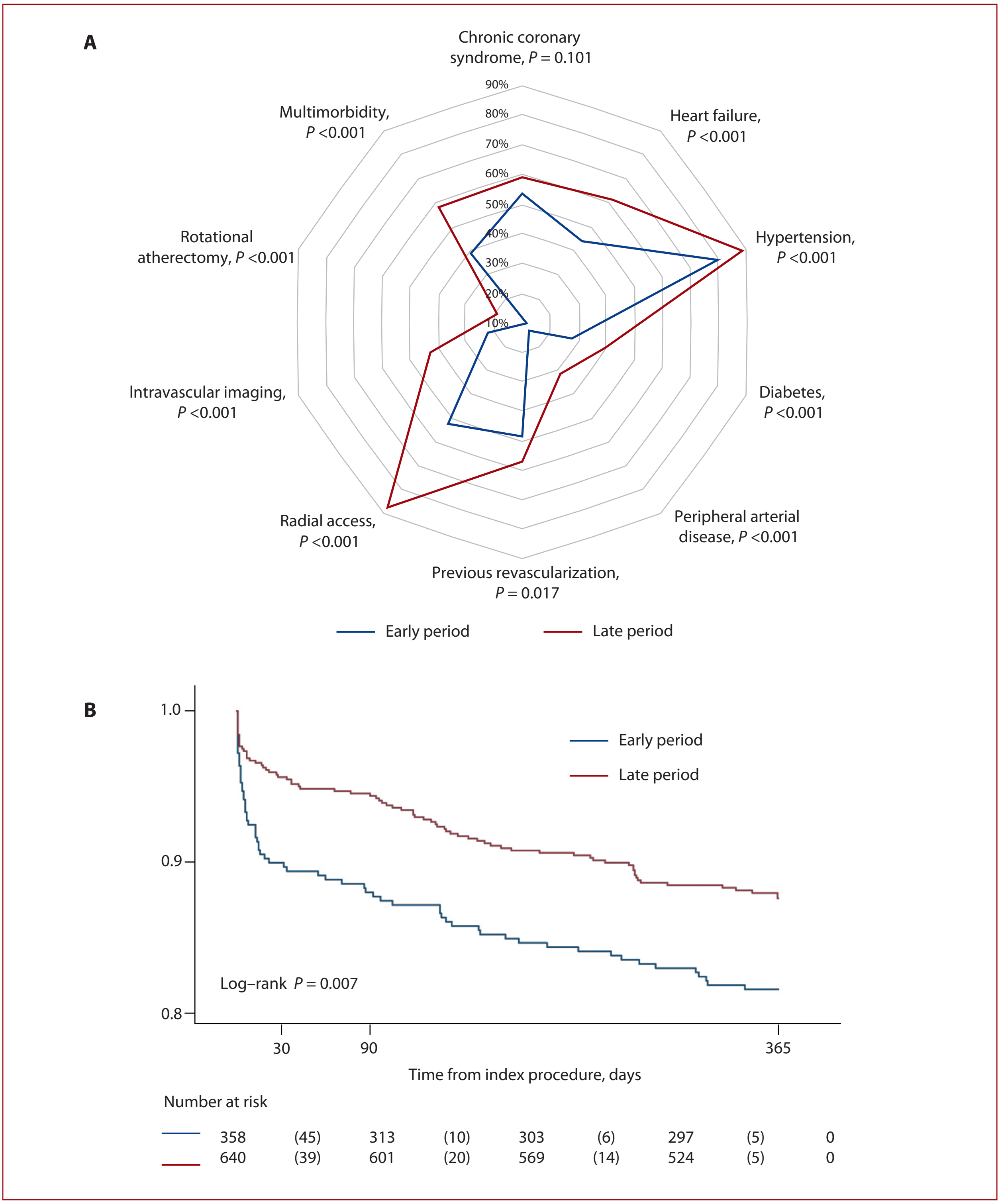

Figure 6. Periodic trends for selected variables and outcomes. **A.** Morbidity and procedural trends. The radar graph should be interpreted as follows: each of the spokes (radii) represents one of the variables and every internal line denotes 10%. **B.** Mortality trends; the early period — 2007–2014, late period — 2015–2022

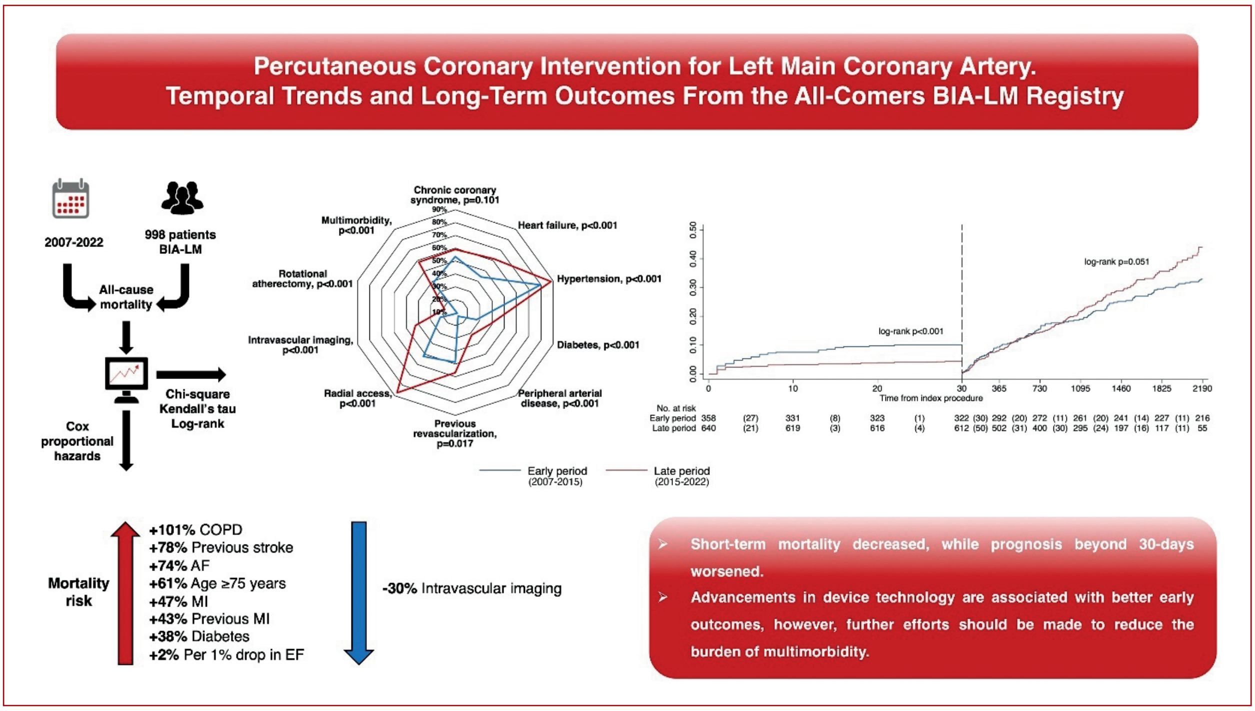

Figure 7. Central illustration

Abbreviations: AF, atrial fibrillation; COPD, chronic obstructive pulmonary disease; EF, ejection fraction; MI, myocardial infarction

including the advent of drug-eluting stents and more potent P2Y$_{12}$ inhibitors, preference for radial access, and use of adjunctive percutaneous tools [10–13]. Mortality reduction driven mainly by better survival in the ACS group with the parallel decrease in the use of IABP and GP IIb/IIIa inhibitors might finally be explained by the growing experience of operators, advances in PCI technique, and development of catheterization lab network in Poland, resulting in guideline-recommended transportation time and invasive treatment [14, 15].

Alarmingly, landmark analysis showed that 6-year mortality rates beyond 30 days increased in the late period. The decline in survival could reflect the concurrent surge in comorbidity rates. Patients hospitalized in the late period were more likely to have complex CAD, often requiring rotational atherectomy. It shows that currently, PCI is often a treatment for patients who were not eligible for CABG due to high perioperative risk, suggesting that guideline recommendations may not be fully applied to the profile of patients met in everyday clinical practice. A report about an increase in rates of multimorbidity with a concurrent decline in survival supplements findings by Zheng et al. [16] showed the worst one-year prognosis in a cluster of patients with CAD and high comorbidity burden. It shows that to sustain favorable outcomes of successful angioplasty in the aging society, pharmacological treatment of comorbidities is crucial and cannot be neglected.

Mortality analysis

Mortality analysis showed that unfavorable prognosis related to medical history and concomitant chronic diseases could potentially be altered by adjunctive percutaneous devices. Using intravascular imaging was associated with the greatest (30%) reduction in mortality risk. In comparison between patients undergoing angiography- or intravascular imaging-guided procedure, the latter had significantly larger diameters of implanted stents and used balloons, higher maximal pressures for stent optimization, and were more likely to have post-dilation. Potential long-term benefits arising from better stent apposition and subsequent lower rates of adverse events were reported in the intravascular ultrasound sub-study of the EXCEL trial, showing higher rates of adverse events during follow-up in patients with small final minimal stent area, compared with those who had the largest area [4]. Until recently, several studies investigated outcomes of intravascular guidance, mainly intravascular ultrasound, in complex PCI, suggesting better outcomes over conventional angiography-guided procedures [17–20]. Although endorsed by the guidelines, information about benefits of intravascular imaging in LMCA lesions is sparse and comes from observational reports and sub-analyses of trials comparing PCI with CABG [4]. Until OPTIMAL trial results are published in the middle of 2025, our results contribute to the limited observational evidence supporting the use of intravascular imaging in LMCA PCI [S7].

Data concerning the impact of comorbidity burden on prognosis in patients undergoing specifically PCI of LMCA is modest as well [4]. In our study, we found that COPD, cerebrovascular disease, AF, and DM significantly increased mortality. DM is often considered to be of special concern in patients with LMCA stenosis and is discussed when assessing the revascularization strategy. The strongest currently available evidence is a number of meta-analyses derived from individual patient data included in RCTs, suggesting a detrimental influence on long-term outcomes only in individuals with multivessel disease [4, 8]. This may be relatable to the BIA-LM cohort, as only 11.5% of patients undergoing PCI had isolated LMCA lesions.

Strengths and limitations

First, given the observative nature of our study, there might have been confounders that were not taken into consideration in the study. We tried to minimize potential bias by covariate adjustment. Some of the early clinical information was missing and could not be retrieved, limiting the completeness of the analyzed data. Currently, the BIA-LM registry does not include data on the number of patients referred for LM PCI due to disqualification from surgical treatment; that information might have given us insight into real-life factors impacting prognosis in this subgroup. To obtain maximal generalizability, the registry was designed as all-comers. It resulted in the inclusion of patients who had been traditionally excluded from such analyses, i.e., patients at extremely high risk of death admitted directly to the catheterization lab in poor hemodynamic state and those with presumably lower risk, who previously received CABG and were referred for the procedure due to the graft failures. The registry used angiographical classification based on the number of diseased vessels instead of the SYNTAX score. Therefore, direct comparisons with other registries should be performed with caution. As the mean yearly rates are relatively small, the current study should be considered as an epidemiological study, capturing temporal trends in clinical practice. Finally, one of the limitations immanent to single-center analyses is limited generalizability. Thus, extrapolations of this study's findings to other settings or populations should be made with caution.

Several strengths of our study are also worth noting. The study included almost one thousand patients followed up over 14 years and provided adequate power for statistical analyses. The all-cause mortality information was available for all included individuals, resulting in high-quality long-term follow-up data. Finally, it was one of the first studies to investigate the temporal trends integrating clinical and procedural data, showing a shift in the profile of hospitalized patients and its consequences. The study included short-, long-term, and landmark analyses, indicating that improvements made in percutaneous procedures are related to better early outcomes, which, however, may be offset by the comorbidity burden.

CONCLUSIONS

The real-world population undergoing LMCA PCI significantly differs from populations analyzed in RCTs and indicated by guidelines, often due to multimorbidity and high operative risk in our patients. Over the years, rates of LMCA angioplasty, complex procedures, and comorbidities increased. Concurrently, rates of complications and early mortality have decreased, however, long-term mortality beyond 30 days after the procedure increased, which may be associated with a high multimorbidity burden and population aging. Long-term analysis showed that intravascular imaging is the only factor associated with a decrease in all-cause mortality.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/polish_heart_journal.

Article information

Abstract presentation: Preliminary results were presented at the ESC Congress, August 25–28, 2023, Amsterdam, NL, and the International Congress of the Polish Cardiac Society, September 28–30, 2023, Poznań, PL.

Acknowledgments: We kindly thank Krzysztof Struniawski for his advice during data preparation and statistical analysis.

Conflict of interest: None declared.

Funding: This research was funded by the Medical University of Białystok, grant number B.SUB.23.600, B.SUB.24.181 and B.SUB.24.535.

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