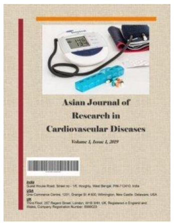

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Comparative Safety and Efficacy of Left Main vs. Non-left Main PCI Optimized using Rotational Atherectomy and Drug-Eluting Stent Implantation in Patients with Chronic Kidney Disease

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Authors' contributions

This work was carried out in collaboration among all authors. Author FTNM designed the study, wrote the protocol and wrote the first draft of the manuscript. All other authors helped in extract the data from medical records, managed the analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

Background: Left main coronary artery disease (LMCAD) is associated with poor cardiovascular outcomes, especially in patients with coexisting chronic kidney disease (CKD). Percutaneous coronary intervention (PCI) using rotational atherectomy (RA) and newer generation drug-eluting stents (DES) has been shown to improve outcomes in CKD patients with complex anatomical lesions. In this study, we assessed and compared the outcomes with this treatment strategy in CKD patients with LMCAD versus non-LMCAD.
Methodology: This was a single-center, retrospective study. From January 2015 to September 2017, all CKD patients with calcified CAD who underwent RA followed by second-generation DES

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implantation at our center were included and divided into subgroups based on left main disease involvement. The primary endpoint was major adverse cardiac and cerebrovascular events ([MACE] composite of all-cause mortality, myocardial infarction (MI), and stroke). Key secondary endpoints include incidence of cardiac arrest, cardiogenic shock, need for emergency coronary bypass surgery and stent deployment failure.

Results: A total of 203 patients were included in the analysis. The majority of the patients in both groups had mild-to–moderate CKD (45.2% vs. 33.8% mild; moderate: 487.9% vs. 60%; severe: 6.1% vs 6.8%; for LMCAD and non-LMCAD patients, respectively). Prognostically worse and procedurally more difficult lesions such as ostial lesions and calcified bifurcations were significantly higher in the LMCAD group vs. the non-LMCAD group (37% vs. 14.6%; p=0.0005 and 68.5% vs 45.4%; p=0.0025, respectively). There were no significant differences in the primary endpoint event rate, between the LMCAD and non-LMACAD groups (12 [9%] vs. 10 [13.7%]; p=0.4548). Myocardial infarction significantly varied between the LMCAD and non-LMACD groups (0% vs. 3 [4.11%]; p=0.0453). Cardiac arrest, arrhythmia, cardiogenic shock, need for emergency coronary bypass surgery, and failure to deploy stent also did not vary between the LMCAD and non-LMCAD groups.

Conclusion: Percutaneous coronary intervention using RA followed by second-generation DES results in improved clinical outcomes in patients with LMCAD disease. Further, the severity of CKD does not affect cardiovascular outcomes in patients with LMCAD and non-LMCAD patients.

Keywords: Chronic kidney disease; left main coronary artery disease; rotational atherectomy; percutaneous coronary intervention; drug-eluting stent.

1. INTRODUCTION

With a blood supply coverage of 75%–100% to the myocardial area, disease affecting the left main trunk of the coronary artery, termed 'left main coronary artery disease' (LMCAD), is considered a poor prognostic marker of cardiac outcomes [1,2]. A blockage of >50% indicates significant LMCAD, and the survival rate decreases with an increase in the severity of the blockage. The three-year survival rate with 50%–70% blockage is 66% and ≥70% blockage is 41% [3]. Chronic kidney disease (CKD) is another condition associated with poor prognosis and a high risk of death [4]. The coexistence of LMCAD and CKD in an individual is, therefore, suggestive of worse outcomes. Data suggest that 9%–23% of patients with CKD have CAD [5,6], of whom about 78.1% have bifurcation or trifurcation of LM segment [7]. Acute renal failure due to contrast media used during percutaneous coronary intervention (PCI) coupled with the risk of embolus formation [8,9] may represent a key challenge in treating CKD patients with CAD. Furthermore, CKD patients with LMCAD have been noted to have higher 30-day composite major adverse cardiac events (MACE) compared to non-CKD patients (20.8% vs. 13.5% respectively) [9]. Additionally, the risk of developing a cardiac event has been reported to increase by 2- to 3-fold in patients with severe CKD compared to non-CKD patients [10]. Thus, CKD and LMCAD are risk factors for developing MACE, and the problem is compounded when the two entities occur concomitantly.

Coronary artery bypass graft (CABG) is the preferred modality for the treatment of CAD in patients with CKD [11,12]. Although initially American and European guidelines were not in favor of PCI, over the years, guidelines now support the use of PCI in the management of patients with LMCAD in CKD patients [13,14]. While the current guidelines give a class II recommendation for the use of PCI when CKD is mild-to–moderate, there is class III recommendation (harmful) for patients with severe CKD [11,12]. In the EXCEL trial, which enrolled 361 patients with concomitant low-to–moderate CKD and LMCAD, acute renal failure—an important consideration in CKD patients—occurred less frequently with PCI vs. CABG (2.3% vs. 7.7%; hazard ratio [HR]: 0.28; 95% confidence interval [CI] 0.09 to 0.87). (7) Further, patients treated with PCI had lower hospitalization, 30-day mortality, myocardial infarction (MI) or stroke and a lower incidence of stent thrombosis (vs graft occlusion) vs. patients treated with CABG.

In addition to the severity of CKD, outcomes with PCI in patients with LMCAD and CKD are also dependent on the extent of coronary calcification [15,16]. Almost one in five patients undergoing PCI have moderate-to–severe calcific lesions [17].

Coronary artery calcification is associated with poor prognosis, increased time of PCI, procedural complications related to stent expansion, incorrect positioning, restenosis, and thrombosis [15,16,18,19]. Patients with CKD develop coronary calcification early, and it is progressive [20,21]. To improve PCI outcomes in patients with calcified lesions, optimization techniques such as rotational atherectomy (RA), orbital atherectomy, and excimer laser coronary angioplasty are currently employed as part of the routine treatment algorithm [22,23]. Among the options available, RA helps in modulating calcified lesions to better facilitate balloon angioplasty and stent implantation. In a study conducted in Europe (N=205), MACE, defined as death, MI, and target vessel revascularization (TVR), in patients undergoing RA followed by drug-eluting stent (DES) implantation was 4.4%, while TLR was low at 6.8% [24]. Other studies have also concluded that RA improves the success of PCI in both the short and long term [25,26,27]. However, it is important to note that there is a dearth of data on the use of RA as an optimization technique in CKD patients undergoing PCI, especially in the subset of patients with LMCAD and CKD, who are at increased risk for coronary events.

We previously presented the effectiveness and safety of PCI in patients with CAD and CKD. Therefore, we conducted this subgroup analysis to evaluate the effectiveness and safety of optimizing PCI by using RA and DES in a subset of LMCAD patients and compared outcomes vs. patients with no LMCAD.

2. MATERIALS AND METHODS

2.1 Study Design and Population

This was a single-center retrospective study. Chronic kidney disease patients with moderate-to–severe calcified LMCAD and non-LMCAD who underwent PCI using RA and DES at our center between January 2015 and September 2017 were included in this study. Data on clinical characteristics and procedural details were sourced from the electronic medical records, lab records, and registers maintained in the hospital. All data available as a hard copy reports were converted into Excel sheets for analysis.

2.2 Procedure Overview

Most rotablation procedures were performed by the femoral route using a 7Fr guide catheter. While rota floppy wire was used in most cases, workhorse wire was exchanged for a rota floppy wire with the help of a microcatheter. To achieve plaque modification, a 1.25-mm or 1.5-mm burr was used individually or sequentially, and the rotational speed was set at 160,000 rpm in most cases, with an increase of up to 200,000 rpm on an as-needed basis. Several procedures required multiple runs, with an average run time of 20 seconds per procedure. The atherectomy procedure was carried out using an in-center rota solution consisting of adrenaline (1ampoule), heparin (3000 units), glyceryl trinitrate (500 mcg), adenosine (500 mcg), and saline (1000 mL).

The procedures were carried out without any left ventricular assist device. Adrenaline was used to prevent any sudden drop in blood pressure. Initially, a temporary pacemaker was used, especially when there was right coronary artery involvement.

For all cases of rotablation, lesion preparation and pre-dilatation using multiple noncompliant balloons were carried out. Following this, a second- or third-generation DES was implanted. In some cases, post dilatation was carried out to optimize the results. Investigations such as intravascular ultrasound were used as appropriate. An echocardiogram check was carried out immediately post procedure and the clotting time set and maintained at around 250–300 seconds.

2.3 Endpoints and Definitions

The definition of CKD was as per the four-component Modification of Diet in Renal Disease (MDRD) study equation [28], i.e. decreased estimated glomerular filtration rate of (eGFR) <60 mL/min/1.73 m^2. Serum creatinine for eGFR estimation was collected before starting the RA procedure. The severity of CKD was adjudicated based on eGFR levels as follows: mild (eGFR 45 to 59 mL/min/1.73 m^2), moderate (eGFR 30 to 44 mL/min/1.73 m^2) and severe (eGFR 15 to 29 mL/min/1.73 m^2). Significant LMCAD was defined as >50% occlusion of the left main vessel diameter, ascertained visually or through invasive and noninvasive procedures. The primary endpoint was major adverse cardiac and cerebrovascular events (MACCE), defined as the composite of death from any cause, MI, and stroke. Secondary outcomes include incidence of cardiac arrest, arrhythmias, cardiogenic shock, need for emergency coronary bypass surgery and stent deployment failure. The follow-up of patients was done telephonically.

2.4 Statistical Analysis

Descriptive statistics were applied as appropriate. While the mean was represented with standard deviation, the median was represented with interquartile range. Frequencies and percentages were used to describe categorical variables. Predefined exploratory analysis was done after relevant subgroups were identified. For ascertaining differences between categorical variables, the chi-square test for association or Fisher's exact test was applied; for numerical variables, two sample t-test was applied. The level of significance was defined as a p-value <0.05.

3. RESULTS

3.1 Baseline Characteristics

A total of 203 patients were included in the analysis. For descriptive purposes, patients' baseline data were divided according to whether the left main artery was involved or not: 73 and 130 patients were grouped into the LMCAD and non-LMCAD groups, respectively. Gender and body mass index did not vary between the two groups. In terms of disease status, there was a statistically significant difference, as 58 (79.4%) patients with LMCAD had chronic stable angina in comparison to 91 (70%) in the non-LMACAD group. Similarly, significant differences were found in patients presenting with acute coronary syndrome (15% vs. 32%; p=0.033 for LMCAD vs. non-LMCAD group respectively). Left ventricular function, as assessed by ejection fraction volume, did not significantly differ between the two groups. The majority of the patients in both groups had mild-to–moderate CKD (mild: 45% vs. 44%; moderate: 48% vs. 60%; severe: 6.15% vs.6.8%; for LMCAD and non-LMCAD respectively). The detailed baseline characteristics are highlighted in (Table 1).

3.2 Lesion and Procedural Characteristics

Table 2 presents the lesion characteristics and procedural details. The LMCAD group had significantly more severe disease (double/triple vessel involvement) as compared to the non-LMCAD group (68 [93%] vs. 75 [57.7%]; p<0.001). Lesions in both groups were diffusively calcified with no difference between patients in the LMCAD and non-LMCAD groups. However, the prognostically and procedurally more difficult lesions, i.e. ostial lesions and calcified bifurcations were significantly higher in LMCAD group compared to the non-LMCAD group (37% vs. 14.6%; p=0.0005 and 68.5% vs 45.4%; p=0.0025, respectively). Anatomically more complex lesions, such as chronic total occlusion and American Heart Association (AHA) Type C lesions, did not differ between the two groups.

Rotablation was carried out in different anatomical locations (proximal, mid, and distal vessels) in the two groups. In terms of stenting techniques, multivessel and bifurcation PCI were carried out in a significantly higher number of patients in the LMCAD group compared to the non-LMCAD group (93% vs. 57%; p<0.001 and 97.2% vs. 34.6%; p<0.000, respectively). In the case of drug-eluting stents, the most commonly used medication was zotarolimus with no significant difference between the LMCAD and non-LMCAD groups (79.4% vs. 70.7%).

3.3 Outcomes

There was a nonsignificant difference in the primary endpoint event rate, MACCE, between the LMCAD and non-LMACAD groups (12 [9.23%] vs. 10 [13.7%]; p=0.4548). Regarding the individual components constituting MACCE, while there was no significant difference in the number of cardiac deaths (5 [6.8%] vs. 6 [4.6%]; p=0.5376), MI significantly varied between the LMCAD and non-LMACD groups (0% vs. 3 [4.11%]; p=0.0453). The severity of kidney disease did not affect outcomes in either group concerning overall MACCE and the individual components comprising it. Secondary endpoints such as cardiac arrest, arrhythmia, cardiogenic shock, need for emergency CABG, and failure to deploy stent did not vary between the LMCAD and non-LMCAD groups. As for adverse events concerning hospital stay and complications the results were comparable between the groups (Table 3). The mean follow-up duration was 24.11 ± 18.05 months. During post discharge follow-up, adverse events were also comparable in the LMCAD and non-LMCAD groups (Table 3).

Table 1. Patient characteristics at baseline for efficacy analysis set

Baseline characteristics	Non-LMCAD (N=130)	LMCAD (N=73)	p-value
Demographics			
Age, mean±SD	63.45±8.78	64.82±8.81	0.2867
Age Category, n (%)			0.1312
40-49	4 (3.08)	4 (5.48)	
50-59	34 (26.15)	11 (15.07)	
60-69	59 (45.38)	31 (42.47)	
70 & Above	33 (25.38)	27 (36.99)	
BMI category, mean±SD	25.62±3.24	25.79±3.72	0.7449
Gender, n (%)			
Male	92 (70.77)	57 (78.1)	0.1946
Female	38 (29.23)	16 (21.92)	
Clinical presentation, n (%)			
Chronic stable angina	91 (70)	58 (79.45)	0.033*
Acute coronary syndrome	39 (32)	15 (18.5)	
Comorbidities and risk factors, n (%)			
Hypertension	116 (89.23)	68 (93.15)	0.4556
Diabetes mellitus	90 (69.23)	43 (58.90)	0.1830
Dyslipidemia	74 (56.92)	42 (57.53)	> 0.9999
Smokeless tobacco user/smoker	72 (55.38)	36 (49.32)	0.6692
History of prior angina	51 (39.23)	40 (54.79)	0.0463*
History of prior MI	20 (15.38)	12 (16.44)	> 0.9999
Family history of IHD	55 (42.31)	33 (45.21)	0.8009
History of Previous PCI or CABG			
Previous CABG	10 (7.69)	10 (13.70)	0.1244
Previous PCI	26 (20)	7 (9.59)	
Previous CABG/PCI	2 (1.54)	2 (2.5)	
N/A	92 (70.77)	54 (73.97)	
LVEF, mean±SD	51.84	49.64	0.0951
LV dysfunction, n (%)			0.2351
Mild	44 (33.85)	33 (45.21)	
Moderate	78 (60)	35 (47.95)	
Severe	8 (6.15)	5 (6.85)	
Stages of CKD, n (%)			0.2351
Mild	44 (33.85)	33 (45.21)	
Moderate	78 (60)	35 (47.95)	
Severe	8 (6.15)	5 (6.85)	

*BMI: Body mass index; CABG: Coronary artery bypass graft; CKD: Chronic kidney disease; IHD: Ischemic heart disease; LMCAD: Left main coronary artery disease; LVEF: Left ventricular ejection fraction; LV: left ventricular; MI: Myocardial infarction; N/A: Not available; PCI: Percutaneous coronary intervention; SD: Standard deviation.*P-value is significant at 5% level of significance.*

4. DISCUSSION

This retrospective study provides unique perspectives, as PCI cardiovascular outcome data for CKD patients with LMCAD are sparse. The following are the main findings of the study: 1) anatomically and histologically complex lesions are more likely to be associated with LMCAD than non-LMCAD; 2) after a follow-up of 24 months, CKD patients with LMCAD and non-LMCAD had similar CV outcomes, as evaluated by MACCE and its individual components (exception of MI); 3) the severity of CKD did not seem to affect MACCE in both the LMCAD and non-LMCAD groups;4) in-hospital cardiovascular adverse events following PCI and DES implantation were low, but post-discharge cardiovascular events were high in both LMCAD and non-LMCAD patients with CKD; and 5) although there were no active comparators in the study, it seems reasonable to deduce that RA procedure and DES implantation can optimize PCI outcomes regardless of the presence of LMCAD.

Table 2. Lesion and procedure characteristics

Angiographic and procedural variables	Non-LMCAD (N=130)	LMCAD(N=73)	p-value
Number of vessels involved, n (%)			
SVD	55 (42.31)	5 (6.85)	<0.001*
DVD	52 (40)	25 (34.25)	
TVD	23 (17.69)	43 (58.90)	
Lesion characteristics, n (%)			
Anatomy of lesions			
Diffuse calcified lesion	110 (84.62)	62 (84.93)	>0.9999
Short heavily calcified lesion	20 (15.38)	11 (15.07)	
Calcified bifurcations	59 (45.38)	50 (68.49)	0.0025*
Ostial lesions	19 (14.62)	27 (36.99)	0.0005*
CTO	21 (16.15)	7 (9.59)	0.2759
AHA type C	130 (100)	73 (100)	
Procedural characteristics, n (%)			
Target vessel for rotablation			
LMCA	0 (0.00)	26 (35.62)	<0.001*
LAD	69 (53.08)	40 (54.80)	
LCX	8 (6.15)	5 (6.85)	
RCA	53 (40.77)	2 (2.74)	
ROTA in proximal vessel	105 (80.77)	48 (65.75)	<0.0001*
ROTA in ostial	15 (11.54)	15 (20.55)	
ROTA in mid vessel	10 (7.69)	1 (1.37)	
ROTA in distal vessel	0 (0)	9 (12.33)	
Pre-dilatation	128 (98.46)	72 (98.63)	>0.9999
Post-dilatation	129 (99.23)	71 (97.26)	0.2940
Side branch wired	22 (16.92)	58 (79.45)	<0.0001*
Bifurcation technique, n (%)			
Cullote	1 (0.77)	6 (8.22)	<0.0001*
DK crush	0 (0)	3 (4.11)	
Mini crush	0 (0)	2 (2.74)	
Not applicable	85 (65.38)	2 (2.74)	
Single	43 (33.08)	51 (69.86)	
TAP	1 (0.77)	9 (12.33)	
Type of PCI, n (%)			
Multivessel PCI	74 (56.92)	68 (93.15)	<0.0001*
Bifurcation PCI	45 (34.62)	71 (97.26)	<0.0001*
CTO PCI	19 (14.62)	6 (8.22)	0.2655
IVUS	17 (13.08)	38 (52.05)	<0.0001*
Type of DES, n (%)			
Biomilus	3 (2.31)	1 (1.37)	0.0665
Everolimus	13 (10)	10 (13.70)	
Sirolimus	21 (16.15)	3 (4.11)	
Stent not used	1 (0.77)	1 (1.37)	
Zotarolimus	92 (70.77)	58 (79.45)	

*AHA: American Heart Association; CTO: Chronic total occlusion; DES: Drug-eluting stent; DK: Double kissing; IVUS: Intravascular ultrasound; LAD: Left anterior descending artery; LMCAD: Left main coronary artery disease; LMCA: Left main coronary artery; LCX: Left circumflex artery; PCI: Percutaneous coronary intervention; RCA: Right coronary artery; ROTA: Rotational atherectomy; TAP: T and small protrusion. *P-value is significant at 5% level of significance.*

Lesion characteristics are known to impact the CV outcomes in patients undergoing PCI procedures [29]. In our study, 85% had diffuse calcified lesions, 15% had short heavily calcified lesions, 45%–68.5% had calcified bifurcations, and 14%–37% had ostial lesions. Moreover, 100% of the lesions were classified as AHA type C.

Table 3. Outcomes and adverse events

Angiographic and procedural variables	Non-LMCAD (N=130)	LMCAD (N=73)	p-value
Endpoints, n (%)			
MACCE	12 (9.23)	10 (13.70)	0.4548
MACCE in mild CKD	1 (2.27)	4 (12.12)	0.0846
MACCE in moderate CKD	8 (10.25)	5 (14.28)	0.5364
MACCE in severe CKD	3 (37.5)	1 (20.0)	0.5228
Cardiac death	6 (4.62)	5 (6.85)	0.5376
MI	0 (0)	3 (4.11)	0.0453*
Cardiac arrest	1 (0.77)	3 (4.11)	0.1336
Arrhythmia	18 (13.85)	12 (16.44)	0.677
Cardiogenic shock	1 (0.77)	4 (5.48)	0.0573
Emergency CABG	0 (0)	1 (1.37)	0.3596
Failure to deploy stent	0 (0)	1 (1.37)	0.3596
Hospital stay adverse events, n (%)			
In-hospital death	1 (0.77)	2 (2.74)	0.2940
LVF	2 (1.54)	1 (1.37)	>0.9999
Arrhythmias	1 (0.77)	1 (1.37)	0.5910
Conduction disturbance	0 (0)	1 (1.37)	0.3596
Chest pain	0 (0)	1 (1.2)	0.3596
Reinfarction	0 (0)	1 (1.37)	0.3596
Stent thrombosis	3 (2.31)	0 (0)	0.5544
Cardiac arrest	0 (0)	2 (2.74)	0.1282
Stroke	0 (0)	1 (1.37)	0.3596
Hematoma	3 (2.5)	2 (2.5)	0.996
Complications	3 (2.31)	2 (2.74)	>0.9999
Follow-up adverse events, n (%)			
Follow-up death	11 (8.46)	7 (9.59)	0.9889
Chest pain	4 (3.08)	0 (0)	0.3416
Shortness of breath	4 (3.08)	1 (1.37)	0.6599
Re-admission	4 (3.08)	2 (2.74)	0.833
Cause of readmission, n (%)			0.5926
CABG	0 (0)	1 (1.37)	
Check CAG	2 (1.54)	0 (0)	
Chest Pain	1 (0.77)	1 (1.37)	
PPM	1 (0.77)	0 (0)	

CABG: Coronary artery bypass graft; LVF: Left ventricular failure; MACCE: Major adverse cardiac and cerebrovascular events; MI: Myocardial infarction; PPM: Permanent pacemaker.
**P-value is significant at 5% level of significance.*

In our study, the left anterior descending artery was involved in more than 50% of the patients, followed by the left circumflex artery (6.9%) and right coronary artery (3%). This finding is comparatively different from that noted in the ROTATE registry [30], where the left anterior descending artery was involved in 53.2% of patients, left circumflex artery in 20.1%, and right coronary artery in 26.7%. In contrast, the EXCEL trial findings were as follows: left anterior descending artery involvement was 33%, left circumflex artery was 18%, and right coronary artery was 23% [7].

From the literature, it is evident that RA procedure can help in optimizing the outcomes in patients with calcified and complex anatomical lesions by changing the physical contour of the lesion and facilitating balloon angioplasty. There has been a paradigm shift: RA procedures have moved away from intensive, aggressive debulking to a more conservative positioning of being an aid to stent deployment and preventing stent under expansion [23]. In the current study, all procedures except one were successfully performed using RA followed by second-generation DES. One patient in the LMCAD group had stent deployment failure.

Apart from RA procedure, DES implantation during PCI has also been associated with lower death rates, MI, and need for revascularization, especially in the subset of patients with CKD [31]. The Chang et al. study shows that DES are superior to bare-metal stents, as they reduce the risk of death by 18% and lower MI risk by 15%; overall improvement have been witnessed over the years [32]. Although the initial guidelines gave a class III recommendation for PCI in patients with LMCAD, 2014 ESC guidelines give a class I–III recommendation—depending on certain factors, specifically anatomic complexity (11). Cumulative evidence from the SYNTAX study [33] establishes that five-year outcomes with PCI and CABG are similar in LMCAD patients; the results of contemporary trials too support these findings. In a meta-analysis of 10,342 patients with left main disease [34], favorable outcomes in terms of mortality, MACE, and target vessel revascularization were seen for DES over BMS in patients with unprotected left main disease. Thus, newer-generation DES have been concretely established as one of the treatment options, given that lesions are anatomically more complex and specific patient characteristics are present.

The focus on outcomes in CKD patients with concomitant CAD is justified, as there has been an increase in the number of PCI procedures done in this context [35]. Recently, the EXCEL trial investigated the effectiveness of PCI compared to CABG in patients with LMCAD. The study patients were divided into the CKD (361) and non-CKD groups (1508). The three-year composite endpoint (any cause of death, MI, or stroke) was significantly higher in the CKD group compared to the non-CKD group. (0.8% vs. 13.5%; hazard ratio [HR]: 1.60; 95% confidence interval [CI]: 1.22 to 2.09; p=0.0005) [7]. Compared to the EXCEL trial, the MACCE event rate in this study was 13.7%. Another contrast was seen in the rate of MI, which was about 7% in the EXCEL trial compared to only 4% in this study. The ROTATE registry is a more pertinent comparison, as this study determined in-hospital and one-year outcomes after RA of heavily calcified unprotected left main lesions (ULM). [30] Of 86 patients with ULM, a total of 43% of study participants fulfilled the criteria for CKD. Our study results are more aligned with those from ROTATE; there was no difference between the ULM and non-ULM groups concerning one-year MACE (5.8% vs. 8%); however, the MACE were higher in the ULM vs. non-ULM group (26.4% vs. 14.9%, p=0.002); the corresponding incidence of stroke and MI was 3.9% vs. 0.8% and 2.6% vs. 0.4%, respectively. In our study, the MACCE and MI event rates were 13.7% and 4%, respectively.

Although this study sheds light on outcomes in CKD patients with LMCAD, it has a few limitations. Firstly, this is a retrospective study with low sample size, and, because of that, missing data is an inherent flaw in the study design. Secondly, the follow-up data was only limited to telephonic visit.

5. CONCLUSION

Percutaneous coronary intervention related cardiovascular outcomes did not differ in CKD patients with LMCAD vs. non-LMCAD over two years. There is increasing evidence to suggest that DES and lesion-optimization techniques such as RA can improve PCI outcomes in patients with left main disease harboring complex anatomical lesions. Future research and prospective studies with large sample size may help confirm these findings and add further value.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Necessary ethics committee approval was obtained before data collection.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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