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HIGH RISK PERCUTANEOUS CORONARY INTERVENTION OF LEFT MAIN BIFURCATION STENOSIS IN A PERITONEAL DIALYSIS PATIENT

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ABSTRACT

Complex coronary artery disease is the leading cause of death in patients with end-stage renal disease. We report a case of a patient on peritoneal dialysis, preloaded with Prasugrel and acetylsalicylic acid as a potent dual antiplatelet therapy (DAPT). The patient underwent a high-risk percutaneous coronary intervention (PCI) due to bifurcation stenosis of the left main stem branch. A "double kiss crush" bifurcation stenting technique was performed. This case provides additional data about the treatment of this group of patients, a group that is often excluded from randomized control trials, but is frequently encountered in cardiovascular practice. Furthermore, it helps to advance PCI treatment along with exploring the safety of potent DAPT in a group that is susceptible to both ischemia and bleeding, thus presenting a great challenge in the decision for treatment.

Keywords: Left main bifurcation stenosis, high risk percutaneous coronary intervention, Prasugrel, optical coherence tomography, end stage renal diseases, peritoneal dialysis

INTRODUCTION

Complex coronary artery disease (CAD) is the leading cause of death in patients with end-stage renal disease (ESRD), especially in patients on dialysis, where death rates are 40-fold higher [1, 2].

There is little data about the most effective treatment of CAD in ESRD patients because they are often excluded from all trials, including randomized control trials, or because they are underrepresented as a group in other published trials. Coronary angiography is often cancelled or delayed in these patients, out of fear of kidney function deterioration, even in patients with acute coronary syndrome who would benefit greatly from angiography and following PCI [3–5]. Still, there are studies that are of great benefit for providing data about this complex group, and these studies could help further the development and improvement of future guidelines [4–7]. In a pre-specified subgroup analysis from the EXCEL trial, chronic kidney disease, including ESRD patients with left main (LM) disease, were linked to poorer outcomes. But there are few relevant data to guide decision making for optimal revascularization in this high-risk group [6].

We report on a case of a patient on peritoneal dialysis (PD) with acute coronary syndrome, preloaded with Prasugrel and aspirin, who underwent a complex PCI procedure of the LM bifurcation stenosis.

CASE REPORT

This report reviews the treatment of a male patient, 54 years old, admitted to the emergency ward, complaining of compressive chest pain with intermittent appearances of 3 weeks. From his past history, we saw that he had arterial hypertension, and implanted drug eluting coronary stents in the mid segments of the Left Anterior Descending (LAD) and Circumflex (Cx) artery 3 years prior. He has ESRD, and has been on PD for almost 6 years. This was regularly followed up with by a nephrologist. Upon admission, his serum creatinine (Cr) level was 1385 μmol/L, which is close to his usual values. Estimated glomerular filtration rate (eGFR) by CKD-EPI was 3.5 ml/min/1.73 m2.

An electrocardiogram (ECG) at admission showed horizontal ST depression in the DI, aVL and V5 and V6 from the precordial leads. A high-sensitive Troponin assay at admission was elevated with 43 and 140 ng/L the second day (UNL 19 ng/L). Blood pressure at admission was 150 over 80 mmHg. He had a functional AV fistula on his left forearm.

A decision was made to perform an initial diagnostic coronarography via a right radial approach. This showed chronic total occlusion of the right coronary artery (Figure 1-1). Left angiography showed complex atherosclerotic disease in the distal part of LM, with 99% ostial stenosis of the Cx artery, and significant ostial stenosis of LAD artery (Figure 1-2, 3). This atherosclerotic lesion was classified as a complex bifurcation lesion with LM involvement with “Medina” classification 1,1,1 [8]. There were no “in-stent” restenosis in LAD and Cx artery stents.

Due to the complexity of the coronary lesion, high serum creatinine, and the clinical stability of patient, a decision for optimal revascularization treatment was postponed. The patient was informed of the angiography finding and the possibilities for treatment. Analysis of the patient's case was made by the heart team, including the clinical risk profile of the patient, and the anatomical and morphological characteristics of the coronary lesion. Additionally, a nephrologist was consulted. The SYNTAX score was 30 [9]. After consultation and attaining the patient's consent for the intervention, a decision was made to perform complex PCI using a “Double Kiss (DK) crush” bifurcation stenting technique. The nephrologist recommended a pre-procedure haemodialysis. After two haemodialyses, performed without complications, the serum Cr was lowered to 890 μmol/l.

The patient was preloaded with 60 mg Prasugrel several hours before the intervention, and just before the procedure,10.000 IE unfractionated heparin was administered intravenously.

The intervention was performed through a right radial approach. A 7F guiding catheter EBU 3.5 was used. The two branches (LAD and Cx) were initially wired with Balance Middle Weight (BMW) guide wires (Abbot Vascular, US).

Coronary stenting procedure

The classic DK-crush bifurcation stenting technique, with two drug eluting stents (DES), was performed.

Step 1: stenting the ostial Cx artery stenosis (DES 4.0/18 mm Orsiro, Biotronik), with several millimetres of stent protruding in the LMN, simultaneously with another balloon parked in the LM/LAD position; (Figure 1-4)

Step 2: LM/LAD balloon dilatation, crushing the protruded part of Cx artery stent;

Step 3: Removal of Cx jailed-wire and LM/LAD balloon, and then rewiring of Cx artery, through the “crushed” stent;

Step 4: First kissing balloon (KB) dilatation of LM/LAD/Cx; (Figure 1-5)

Step 5: Main vessel stenting: LM to LAD, from the ostium of LM (DES 4.5/26 mm Resolute-Onyx, Medtronic); (Figure 1-6)

Step 6: First “Proximal Optimization Technique” (POT) balloon dilatation of LM stent, with the non-compliant balloon, just proximally of carina.

Step 7: Removal of Cx jailed-wire, rewiring the Cx artery and balloon dilatation of Cx artery stent for strut dilation;

Step 8: Second KB dilatation and final POT of LM (NC Balloon 4.5/15 mm x 16 atm) (Figure 1-7,8).

The final angiography revealed an excellent angiography result, with optimal stents expansion and lesions coverage, and normal TIMI 3 flow (Figure 1–9).

Optical coherence tomography (OCT) was performed after stenting, showing an excellent

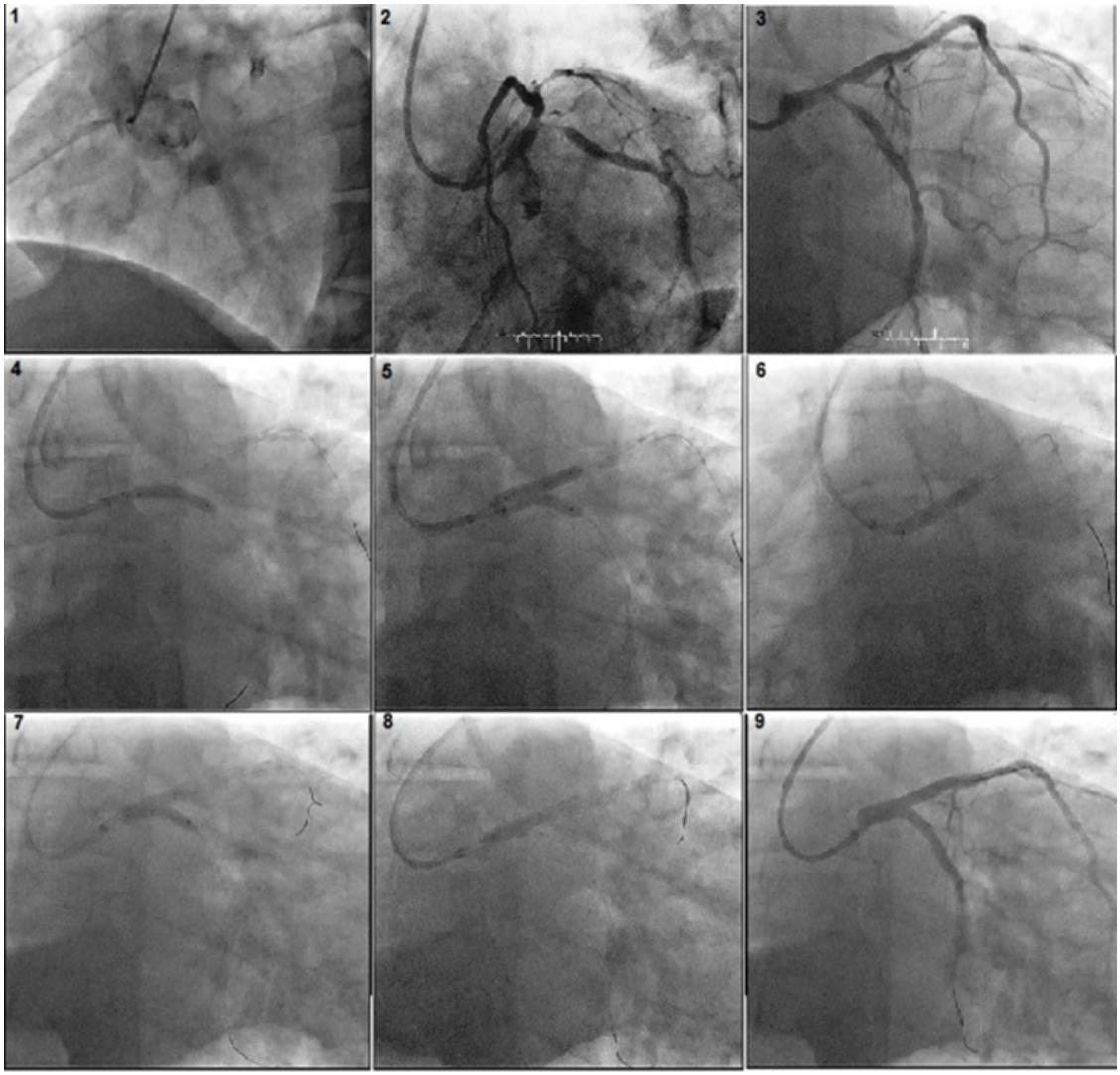

Figure 1. *1-1 Chronic total occlusion RCA; 1-2,3. Critical ostial stenosis of Cx artery and stenosis of ostial LAD, with involvement of LM; 1-4. Stenting of ostial stenosis of circumflex artery; 1-5. First KB dilatation LM/LAD/Cx, 1-6. Stenting of LM/LAD artery; 7. Second KB dilatation of LM/LAD/Cx; 1-8. Final POT; 1-9. Final angiographic result.*

result with optimal stent expansion, full lesion coverage and adequate apposition of LM/LAD stent and Cx artery stent. (Figure 2).

Procedural time was 85 minutes from the beginning of the radial artery puncture, with a fluoroscopy time of 24 minutes. Iodine contrast volume spent was 350 ml.

Three hours after the procedure, a haemodialysis was performed. Follow up serum creatinine was 800 umol/l. The patient was discharged the next day on DAPT (Prasugrel 10mg QD, Acetylsalicylic acid 100mg QD), Amlodipine 10 mg QD and Metoprolol succinate 47,5mg QD.

After three and six months, at clinical follow up, the patient was stable, without chest pain and without registered complications. His serum creatinine was 782 umol/l and serum Potassium 4.8 mmol/L.

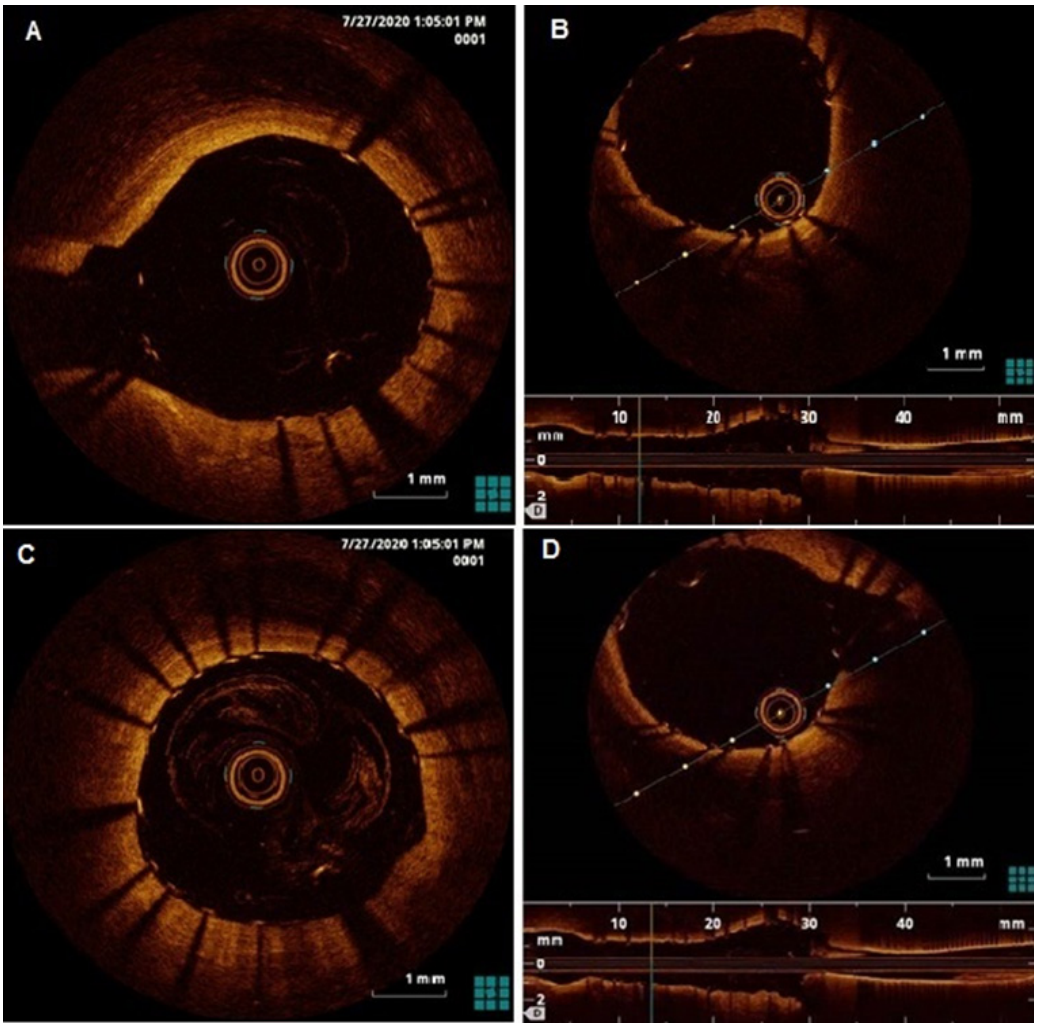

Figure 2. *A-OCT of distal part of LM/LAD stent in proximal part of LAD; B-OCT of middle part of LM/LAD stent near to ostium of LAD; C- LM with 2 visible layers of stent with adequate stents expansion and apposition; D- OCT at bifurcation level, ostial LAD and ostium of Cx.*

DISCUSSION

Patients with ESRD on dialysis have many comorbidities, being at greater risk for many types of adverse events such as bleeding complications, morbidity, and mortality by MI or stroke [10,11]. The prognosis of these patients is often poor, especially in patients with LM coronary artery disease. Coronary arteries in ESRD patients are often extremely calcified, increasing the complexity of coronary interventions. The presence of artery calcifications is directly associated with cardiovascular (CV) events and a consequent increase in mortality. It is postulated that CV calcifications are an important predictor of future events and the clinical outcome of these patients [12-14].

LM coronary artery disease is present in 15% of patients with symptomatic CAD [15]. CABG, at this time, still remains the standard for treatment for this disease according to both European Society of Cardiology [16] and American College of Cardiology [17] guidelines. The recommendation for PCI depends on the anatomical complexity of the CAD, based on the SYNTAX score and the surgical risk of the patients. As a result of newly published studies and in recent changes of the guidelines, PCI is emerging as a valuable and successful alternative, especially in patients with low Syntax score (≤32)[6,16].

Nevertheless, most of the previously published trials involving PCI vs. CABG were not adequately powered to explore the difference the two, and could not obtain correct results regarding the type of treatment for LM CAD. The

newly published EXCEL [6] and NOBLE [18] trials, using the new generation drug eluting stents with proven safety and efficacy, have contrasting results, therefore more studies are needed for a definite resolution of this problem [6].

On the other hand, LM coronary artery disease in chronic kidney disease (CKD), including ESRD patients, is a different matter. This was explored in the EXCEL trial that showed no significant differences between PCI and CABG in terms of death, stroke, or MI at 3 years, in the CKD/ESRD patient subgroup. But PCI in this subgroup was associated with lower rates of major adverse events at the 30 days follow up. There was a lower incidence of major arrhythmia, sternal wound dehiscence, infection requiring antibiotics, worsening renal function, bleeding complications, and less need for transfusion in the PCI subgroup [6].

There is also a difference in outcomes, after revascularization, between different dialysis modalities. The decision for PCI instead of CABG in our patient on PD was justified by results from several studies. According Han-Yan et al. [19], patients with ESRD, on PD, have poorer in-hospital outcomes after CABG. Wang Z et al. [20] showed that in this group of patients, on PD, PCI with DES vs CABG has a similar long-term outcome.

The decision for optimal revascularization by the heart team, consisting of interventional cardiologists, a cardiac surgeon, and a nephrologist in this case, was to establish multi-disciplinary shared decision-making. The use of the heart team is encouraged by current guidelines and, as a multi-disciplinary approach, may provide better outcomes. Also, current ACC/AHA guidelines recommend calculation of an STS and SYNTAX score for patients with complex CAD or unprotected left main LM disease, based on including the clinical risk profile of the patient, and anatomical and morphological characteristics of the coronary lesion [21].

Due to the complexity of the intervention, and a higher percentage of ischemic complications after PCI in this subgroup of patients, according to published studies, a decision was made to preload the patient with Prasugrel as a potent antiplatelet therapy. The use of Prasugrel was strengthened by the fact that its active metabolite is not likely to be removed by dialysis, unlike Clopidogrel, providing a more stable therapeutic concentration. In addition, Prasugrel's platelet inhibition is markedly stronger compared to Clopidogrel, and ischemic events were significantly lower in randomized studies of patients with acute coronary syndrome at discharge and follow up [22-24].

The leading TRITON-TIMI 38 study showed that Prasugrel is more effective than Clopidogrel in preventing ischemic events in patients with ACS undergoing PCI [24]. Exposure to the active metabolite of Prasugrel in ESRD patients is still lower than in healthy control patients, but that does not affect platelet aggregation [25]. That is why it is not necessary to adjust the dosage of Prasugrel in ESRD patients. There is substantial evidence in randomized studies regarding the safety of long term DAPT >12 months in ESRD patients on dialysis with reduction of MACCE and without significant increase in bleeding [26]. According to one study, the benefit of prolonged DAPT may persist until ≥2 years after PCI in dialysis patients including PD.

We used an OCT for assessment of stent expansion and apposition, even though Intra Vascular Ultra-Sound (IVUS) is currently recommended by international guidelines to guide LM PCI. There are several studies investigating the role of OCT in LM stenting [27-29]. Recent studies present that OCT image quality in LM bifurcation was not inferior to those in non-LM bifurcation [28]. Amabile et al. [27] showed that this method is safe and feasible in distal LM PCI. Cortese et al. [29] present an improved angiographic outcome using OCT in distal LM PCI, compared to conventional angiography-guided procedures. OCT imaging guidance provides adequate stent expansion, less malapposition which leads to improvement of the clinical outcome [28]. All these advances by OCT, which improve clinical outcome, may alter the decision for which type of revascularization is used in this group of patients [20].

CONCLUSIONS

Our case of LM PCI intervention in the patient on PD was a successfully treated case in a rarely published field. Our experience suggests that LMCAD in patients with ESRD, on PD, can be treated successfully with PCI, irrespective of the location of the lesion. Certainly, OCT imag-

ing provides crucial details that may alter pre- and post-PCI management and improve both short and long-term outcomes. Another significant point is the use of potent DAPT with Prasugrel in this case, without registered bleeding complications during intervention and at follow up, and with a significant benefit in preventing future ischemic events.

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Резиме

ВИСОКОРИЗИЧНА ПЕРКУТАНА КОРОНАРНА ИНТЕРВЕНЦИЈА НА СТЕНОЗА НА ЛЕВАТА ГЛАВНА БИФУРКАЦИЈА КАЈ ПАЦИЕНТ НА ПЕРИТОНЕАЛНА ДИЈАЛИЗА

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Комплексната коронарна артериска болест е водечка причина за смртност кај пациентите во краен стадиум на бубрежна слабост. Презентираме случај на пациент на перитонеална дијализа, пред процедура третиран со прасугрел и ацетилсалицилна киселина како моќна двојна антитромбоцитна терапија (ДАТТ), кој бил подложен на високо ризична перкутана коронарна интервенција (ПКИ), поради стеноза на бифуркација на главното стебло на левата коронарна артерија. Изведена е техника на стентирање на бифуркација “Double-Kiss-Crush”. Овој случај обезбедува дополнителни податоци за третманот на оваа група пациенти, кои често се исклучени од рандомизирани клинички студии, а се чести во кардиоваскуларната практика. Помага и во унапредувањето на третманот со ПКИ, заедно со истражување на безбедноста на потентната ДАТТ во оваа група, која е подложна и на исхемија и на крвавење и претставува голем предизвик во одлуката за третман.

Клучни зборови: стеснување на бифуркацијата на левото главно стебло, високо ризична перкутана коронарна интервенција, прасугрел, оптичка кохерентна томографија, хронична бубрежна болест во краен стадиум, перитонеална дијализа