Pentafurcation of left main coronary artery

Paweł Tyczyński[1], Rafał Wolny[1], Hubert Łazarczyk[2], Paweł Litwiński[3], Sang Wook Kim[4], Adam Witkowski[1]

[1]Department of Interventional Cardiology and Angiology, Institute of Cardiology, Warsaw, Poland
[2]Department of Information Technology, Institute of Cardiology, Warsaw, Poland
[3]Department of Cardiac Surgery and Transplantology, Institute of Cardiology, Warsaw, Poland
[4]Heart Research Institute, Chung-Ang University Hospital, Seoul, South Korea

Adv Interv Cardiol 2016; 12, 4 (46): 377–379
DOI: 10.5114/aic.2016.63641

Pentafurcation of the left main coronary artery (LMCA) is a rare finding. In anatomical studies the frequency of LMCA pentafurcation ranges from 1% to 3.4% [1]. However, to the best of our knowledge it has not been reported in angiographic studies.

We describe a clinical case of a patient with such an unusual angiographic feature.

A 67-year-old male patient with a history of arterial hypertension and heavy smoking was admitted to the emergency department with symptoms of unstable angina. Based on elevated troponin T up to 116 ng/l (UNL < 14), non-ST elevation myocardial infarction was diagnosed. Immediate coronary angiography revealed LMCA pentafurcation with significant ostial lesions in the left anterior descending coronary artery as well as in three intermediate branches and tandem lesions in the right coronary artery (RCA) (Figures 1 A–C). According to the previously proposed modification of the Medina classification [2], the culprit LMCA pentafurcation lesion was assigned as 0.1.1.1.1.0. The patient underwent coronary artery by-pass grafting (CABG). The post-procedural course was uneventful.

Acute coronary syndrome due to culprit lesion located in LMCA multifurcation is a challenging and high-risk clinical scenario. Possible treatment options include percutaneous coronary intervention (PCI) and CABG. There are very limited data on the preferred revascularization strategy. It seems reasonable that for hemodynamically stable patients with acceptable surgical risk, CABG will be the treatment of choice. In the present case this approach was chosen with a good result. However, in unstable patients with ongoing ischemia and poor ejection fraction, salvage PCI must always be considered. Available data on PCI outcomes are confined to LMCA trifurcation only [3]. Dedicated techniques such as the Szabo technique, V-stenting, etc., have been developed for precise treatment of ostial lesions [4]. However, their limitations and required expertise should be kept in mind [5, 6]. Whatever technique is used, intravascular ultrasound (IVUS) guidance seems to be critical when the LMCA is involved in the treatment [7, 8]. Minimal stent area (MSA) cut-offs have been previously identified to prevent in-stent restenosis [9]. However, the proposed MSA of 6.3 mm^2 for the left anterior descending coronary artery (LAD) ostium may not necessarily apply in this case, where the LAD itself is smaller and covers a smaller myocardium area. Plaque shift from the LAD ostium into the LMCA seems to be highly probable in this particular case, thus precluding stenting confined only to the ostia of the LMCA branches. However, the diameter discrepancy between the LMCA and its branches (reference lumen diameters 4.5 mm for LMCA and 3.0–3.5 mm for proximal LAD, respectively) makes adequate stent sizing problematic. The proposed technique of LMCA PCI is presented in Figure 2. However, other technique options like use of the ostium-dedicated, self-expanding STENTYS stent may be considered.

The femoral artery is punctured with a 7 Fr sheath. Sequential steps of PCI are summarized below.

1. Wiring at least four LMCA branches.
2. Balloon predilatation of intermediate branches.
3. Drug-eluting stent (DES) implantation across the LAD ostium up to the mid LMCA. The DES is sized to proximal LAD diameter.
4. Proximal optimization technique (POT) for distal LMCA.
5. The DES implantation to at least two (or three) intermediate branches (double TAP technique).
6. Triple kissing balloon or sequential kissing balloon.
7. Final POT.
8. The IVUS examination for good LMCA stent strut apposition.

Corresponding author:
Paweł Tyczyński MD, PhD, Department of Interventional Cardiology and Angiology, Institute of Cardiology, 42 Alpejska St, 04-628 Warsaw, Poland, phone: +48 696 091 079, e-mail: medykpol@wp.pl
Received: 2.04.2016, **accepted:** 30.05.2016.

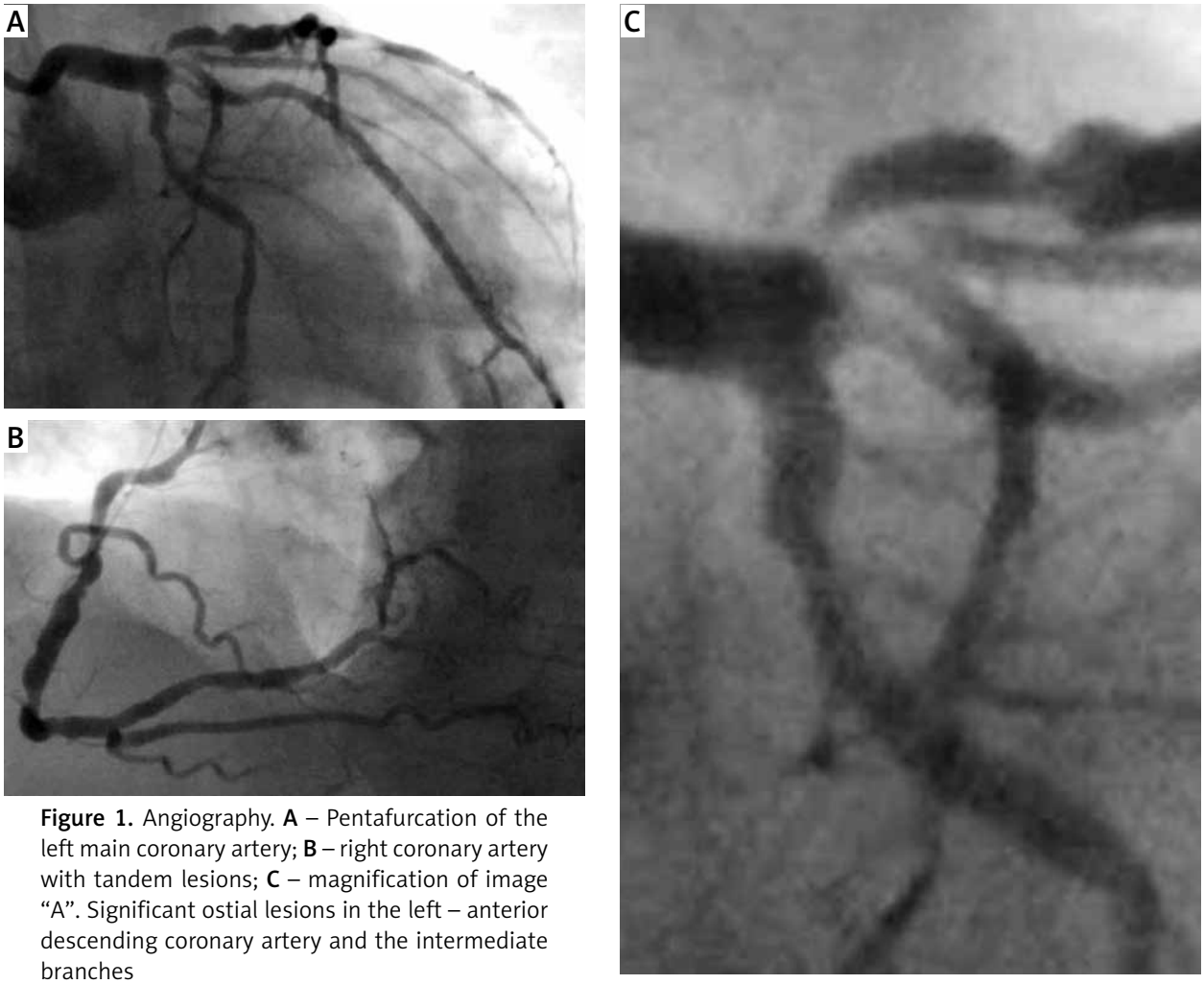

Figure 1. Angiography. **A** – Pentafurcation of the left main coronary artery; **B** – right coronary artery with tandem lesions; **C** – magnification of image "A". Significant ostial lesions in the left – anterior descending coronary artery and the intermediate branches

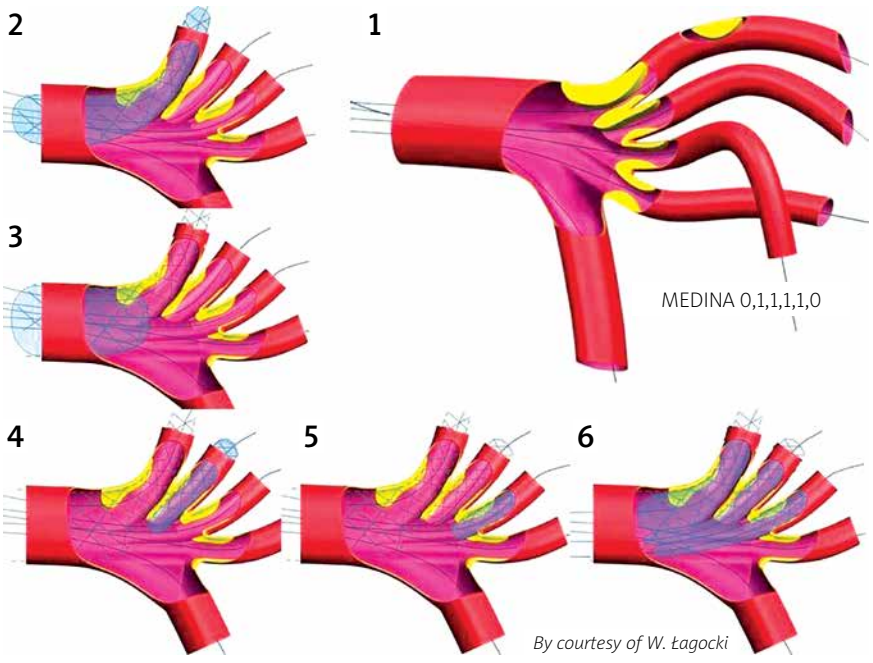

Figure 2. Illustration of sequential steps of percutaneous angioplasty of the left main coronary artery pentafurcation

The next step is the RCA PCI, which does not seem to be technically demanding, although it requires long segments to be covered with DES.

Conflict of interest

The authors declare no conflict of interest.

References

1. Agrawal R. Anatomical study of branching pattern of main trunk of left coronary artery and its importance. Indian J App Research 2016; 6: 626-8.
2. Tyczyński P, Karcz MA, Łazarczyk H, et al. Quadrifurcation of the left main coronary artery and acute coronary syndrome. Kardiol Pol 2015; 73: 299.
3. Kubo S, Kadota K, Sabbah M, et al. Clinical and angiographic outcomes after drug-eluting stent implantation with triple-kissing-balloon technique for left main trifurcation lesion: comparison of single-stent and multi-stent procedures. J Invasive Cardiol 2014; 26: 571-8.
4. Kwan TW, James D, Huang Y, et al. Perfection of precise ostial stent placement. J Invasive Cardiol 2012; 24: 354-8.
5. Jain RK, Padmanabhan TN, Chitnis N. Causes of failure with Szabo technique – an analysis of nine cases. Indian Heart J 2013; 65: 264-8.
6. Girasis C, Onuma Y, Wong CK, et al. Long-term outcome after the V stenting technique in de novo bifurcation lesions using drug-eluting stents. EuroIntervention 2009; 5: 197-205.
7. Kang SJ, Ahn JM, Kim WJ, et al. Intravascular ultrasound assessment of drug-eluting stent coverage of the coronary ostium and effect on outcomes. Am J Cardiol 2013; 111: 1401-7.
8. Hsieh IC, Chen CC, Chang SH, et al. Impact of intravascular ultrasound on the long-term clinical outcomes in the treatment of coronary ostial lesions. Catheter Cardiovasc Interv 2013; 82: 727-3.
9. Kang SJ, Ahn JM, Song H, et al. Comprehensive intravascular ultrasound assessment of stent area and its impact on restenosis and adverse cardiac events in 403 patients with unprotected left main disease. Circ Cardiovasc Interv 2011; 4: 562-9.