Culotte Stenting in the Acute Myocardial Infarction with Distal Left Main Thrombosis: A Case Report

Songül Usalp, Emine Altuntaş, Kanber Öcal Karabay

Department of Cardiology, Sancaktepe Sehit Profesor İlhan Varank Education and Training Hospital, Istanbul, Turkey

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SOUHRN

Kontext: Invazivní léčba bifurkačních lézí distálního nechráněného kmene levé věnčité tepny (unprotected distal left main bifurcation lesion, UDLMBL) je spojena s těžkým rozhodováním a vyžaduje zkušenosti v tomto směru. Popisujeme úspěšnou intervenci se zavedením bifurkačního stentu při UDLMBL u pacienta s akutním infarktem myokardu s elevacemi úseku ST (STEMI).
Popis případu: Šestašedesátiletý muž byl přijat s typickou bolestí na hrudi; EKG prokázalo akutní inferoposterolaterální infarkt myokardu. Koronarografie odhalila bifurkační lézi v distálním segmentu kmene levé věnčité tepny. Následně byl úspěšně zaveden dedikovaný bifurkační stent. Další průběh byl bez příhod a pacient byl propuštěn z nemocnice v dobrém stavu.
Závěr: Při infarktu myokardu s elevacemi úseku ST lze použít dedikovaný bifurkační stent. Léčba UDLMBL při akutním STEMI se může lišit podle zkušeností pracoviště a vlastní volby operatéra.

Keywords:
Culotte stenting
Interventional treatment
STEMI
Thrombosis
UDLMBL

ABSTRACT

Background: The invasive treatment approach to unprotected distal left main bifurcation lesions (UDLMBL) is a difficult decision and requires experience in this regard. We present the successfully interventional treatment with culotte technique of UDLMBL of the patient presenting with acute ST-elevation myocardial infarction (STEMI).
Case summary: A 66-year-old male patient admitted with typical chest pain, his ECG showed acute infero-posterolateral myocardial infarction. Coronary angiography revealed distal LM true bifurcation lesion. The successful culotte technique was performed. The patient was followed without events and discharged in a good condition.
Conclusion: The culotte technique can be performed in the setting of ST-elevation. The treatment method in the approach to UDLMBL in acute STEMI may vary depending on the experience of the centre and the choice of operator.

Introduction

Coronary bifurcation lesions account for 15–20% of patients undergoing percutaneous coronary intervention (PCI) procedures.[1–3] In unprotected distal left main bifurcation lesions (UDLMBL) scheduled for PCI, some clinical scenarious could be more appropriate for the dual stent strategy when taking into consideration vessel diameters, and areas it provides, rather than the single-stent approach.[4] In general, if there is a side branch that is 2.5 mm in diameter or larger, the diameter of the main branch and side branch is close to each other, the angle between the side and the main branch is bellow 70 degrees, the culotte technique can be considered to the forefront than other stent techniques.[3–5]

We aimed to show the culotte technique can be performed in the setting of acute ST-elevation myocardial infarction (STEMI) with UDLMBL.

A 66-year-old male patient was presented with typical chest pain for one hour. Except for smoking, he does not have any other cardiovascular risk factors. The patient's clinical situation was stable: arterial blood pressure was 124/85 mmHg, heart rate 66 bpm, respiratory rate 14/min, body temperature 36 °C, heart and pulmonary sounds were normal.

Electrocardiography showed ST elevation in leads I to II, aVF, V_5–V_6 and ST depression in aVR, V_1–V_3 derivations (Fig. 1).

Laboratory findings were normal except for high troponin level (143 pg/L [0–14 pg/L]).

Address: Songül Usalp, MD, Sancaktepe Sehit Profesor Ilhan Varank Education and Training Hospital, Department of Cardiology, Istanbul, Turkey, e-mail: dr.songulusalp@hotmail.com
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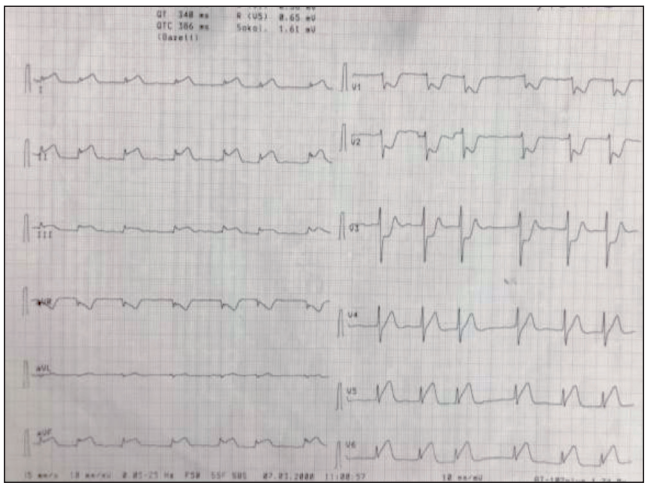

Fig. 1 – A 12-lead electrocardiography of the patient showed ST-elevation in lead 1–3, aVF, V_5, V_6 derivation and ST-depression in V_1–V_3.

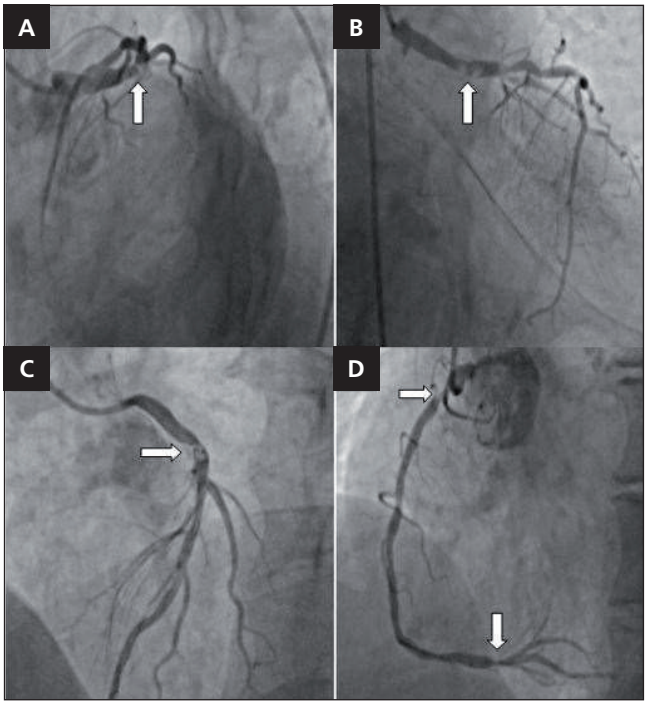

Fig. 2 – Coronary angiogram showed distal left main lesion with thrombosis including LAD and Cx ostium. There was serious stenosis in the proximal and distal region of the RCA.

The transthoracic echocardiography demonstrated estimated left ventricular ejection fraction was 50%, mild anterior apical and lateral wall hypokinesia, normal systolic pulmonary artery pressure and ascending aortic diameter.

Considering the diagnosis of acute STEMI, acetylsalicylic acid 300 mg (PO), ticagrelor 180 mg (PO), pantoprazole 40 mg (iv) and 10 000 U of heparin sodium was administered intravenously. The patient was taken to the catheter laboratory after obtaining verbal consent from the patient and his relatives.

Coronary Angiography and Culotte Stenting Technique: Coronary angiographic images revealed severe distal left main (LM) and ostial left anterior descending artery (LAD) lesions with the completely occluded circumflex artery (LCx) (Figs 2A–2C). There was also significant stenosis in the proximal and distal region of the right coronary artery (Fig. 2D). 10 000 U of unfractionated heparin was administered intravenously. The left guiding catheter (Judkins 7F L4) was placed into the LM and in the LCx was visible restorated flow probably due to migration, possibly effect of hydraulic force from contrast injection (Fig. 3A). Two floppy guidewires were placed from the LM to the LAD and LCx (Fig. 3B). Balloon angioplasty was conducted with a 2.5 × 15 mm compliant balloon in each branch using an equal size (Fig. 3B). Firstly, a 3.0 × 24 mm, sirolimus-eluting coronary *stent was placed into* LCx (Fig. 3C). A third floppy guidewire was used to cross the LCx stent struts to reach the LAD. Subsequently a 1.0 × 20 mm, resp. 2.0 × 15 mm small non-compliant balloons were used to open the LCx stent struts and prepare the way for the second stent on the second wire in the LAD. The first wire in the LAD was removed and a 3.0 × 24 mm sirolimus-eluting stent was deployed into LAD (Fig. 3D). Another floppy guidewire was rewired into the LCx via the LAD stent strut and the stent strut was opened with

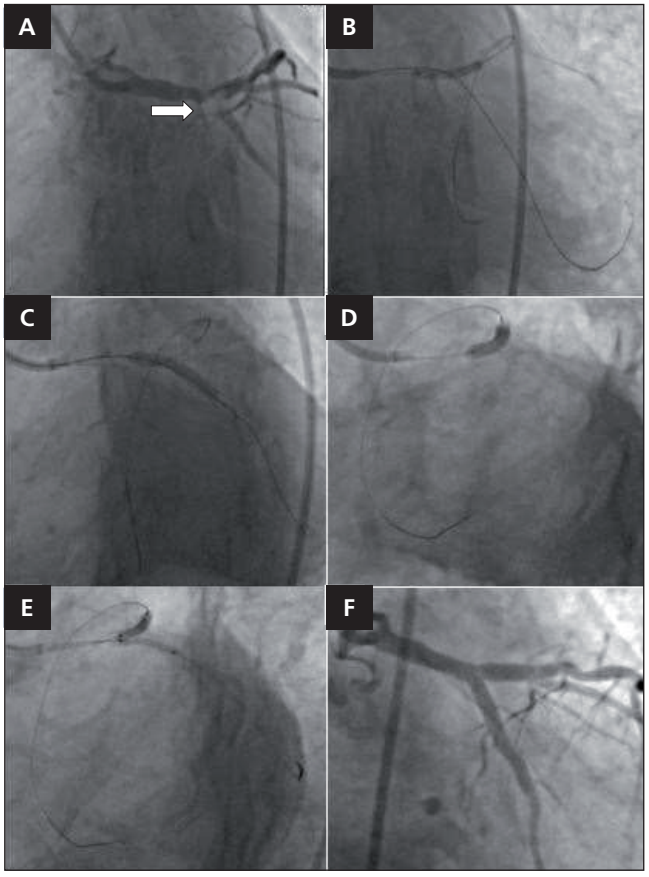

Fig. 3 – Coronary angiography performed with left Judkins 7F, CX blood flow was observed slightly. Firstly LAD then CX balloon was inflated. Primary, a 3.0 × 24 mm stent was placed in the LCx. A small non-compliant balloon was used to open the LCx stent struts and prepare the way for the second stent on the second wire in the LAD. A 3.0 × 24 mm stent was deployed into LAD. At the end of the culotte stenting, both the LAD and the LCx artery were dilated using compliant balloons and kissing balloon at the same time. At the end of the coronary angiography showed TIMI-3 flow in the LAD and LCx artery without any complications.

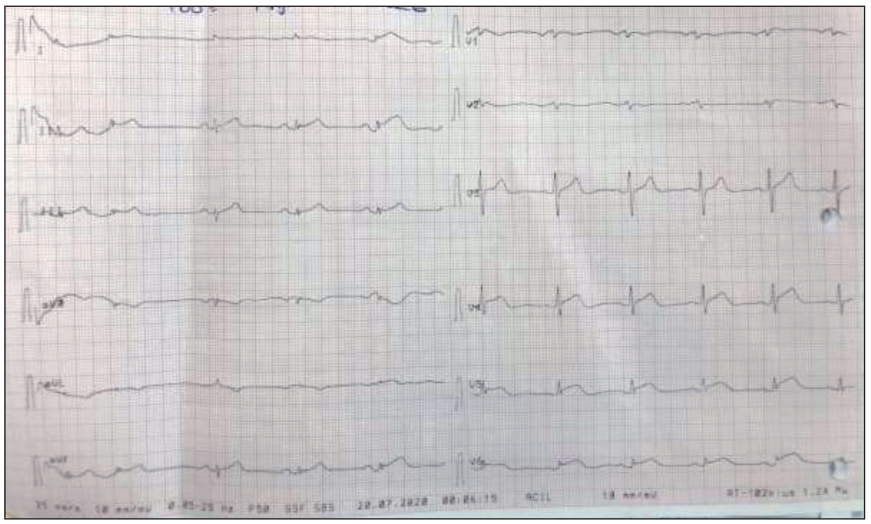

Fig. 4 – A 12-lead electrocardiography of the patient showed improvement in ST-elevation.

the same baloon technique as described above for LCx stent. LAD and LCx were post-dilated sequentially using a 3.5 × 15 mm compliant balloon. At the end of the culotte two-stent technique, a 2.5 × 20 mm compliant balloon was placed in the LAD and a 2.0 × 20 mm balloon was placed in the LCx vessel to perform final simultaneous kissing balloon inflation (Fig. 3E). Since these are the balloon sizes available in our hospital, a smaller balloon had to be used for post dilatation. The final POT postdilatation in the LMCA was performed with 3.5 × 15 mm balloons after kissing balloons procedure.

After final kissing balloons, images showed TIMI-3 flow in the LAD and LCx artery without any complications (Fig. 3F). Glycoprotein IIb/IIIa receptor antagonist (Tirobifan) was administered intravenously during the procedure, adjusted for patient weight. Following the initial 30-minute loading dose (28 ml/hour), a maintenance infusion dose was administered (7 ml/hour).

The patient was successfully treated interventionally with the culotte stenting technique and was followed without any event while under medical treatment and was then discharged. During follow-up, the patient was not scheduled for CAG because the patient did not give consent for CAG again. He had no complaints about the cardiovascular system during the follow-up period. The patient still regularly comes to the outpatient clinic controls. Dual antiplatelet therapy (acetylsalicylic acid and ticagrelor) was administered for 1 year. During the follow-up one year after, there has not been observed any complication with the antiplatelet treatment.

Discussion

UDLMBL or trifurcation lesions are one of the scariest scenarios to be encountered in patients undergoing PCI. Our patient had both STEMI and UDLMBL, fortunately, the patient was successfully treated using the culotte stenting technique.

In previous studies comparing single and double stent techniques in LM bifurcation lesions it was suggested that the provisional stent technique could be superior to two stent technique due to the high rate of cardiac death, myocardial infarction (MI), and target lesion failure (TLF).[10,11] After the DEFINITION and DK CRUSH studies[4] published favourable results of the double stent techniques, attention was turned back to two stent strategies.[3–6]

DK CRUSH–V study found that 1-year TLF, target vessel myocardial infarction and target lesion revascularization (TLR) were less frequent in upfront two stent strategy group than in provisional stent technique in UDLMBL.[7] After 3 years of follow-up, death, MI, TLR and stent thrombosis (ST) were observed to be similar in both groups.[8] However, in the DK CRUSH study, patients with silent ischaemia, stable or unstable angina pectoris or MI>24 h before treatment were included, concurrently patients with PCI intended in a true de novo distal LM bifurcation lesion. Our patient had STEMI clinical setting and there are only limited data that we could compare when deciding the treatment options for our patient. In our case, taking in account the anatomic characteristics of the patient's lesions, the materials available in our centre, we decided that among the known two-stent methods, the culotte technique could be preferred for our patients.[5]

There are conflicting results in studies comparing the culotte technique and the other two stent techniques in UDLMBL. The DK CRUSH III[6] study showed that the culotte technique was associated with increased major adverse cardiovascular events (MACE), target vessel revascularization (TVR) and ST compared to the Double Kissing [DK] Crush technique.[6] Rigatelli et al.[9] compared the double stenting techniques used in patients presenting with STEMI or cardiogenic shock and in whom distal LMCA lesions were detected on coronary angiography. They suggested that the nano-crush stenting technique may have some advantages over T-stenting or culotte in terms of processing speed and contrast volume. They found that nano-crush showed comparable survival for culotte and slightly better survival compared to T-stenting, with globally better recovery of left ventricular EF at mid-term follow-up.[9] The ongoing EBC-MAIN study is expected to clarify the approach to distal LM bifurcation lesions.[10]

In the unprotected left main lesion, intravascular ultrasound (IVUS) may be considered to optimize stent ther-

apy. In the MAIN-COMPARE study,[11] the use of IVUS was shown to reduce long-term mortality in hemodynamically stable patients with unprotected LMCA lesions undergoing elective stent implantation.[11] However, since IVUS was not available in our hospital, stent optimization was performed with traditional imaging techniques. In addition, our patient admitted to the hospital with the acute coronary syndrome.

Conclusion

The number of publications involving patients presenting with acute STEMI and treated with UDLMBL is limited, and there is insufficient data deciding which method is the most appropriate stenting strategy for particular situation. Available in the centre and the operator experience with treatment of UDLMBL plays the role. Therefore, the material in the centre of coronary angiography should be sufficient and the operator should be experienced in UDLMBL. We believe that future large-scale studies on this topic will shed light on the PCI technique for UDLMBL anatomy.

Author contribution statement
Substantial contributions to conception and design, or analysis and interpretation of data; S.U., K.Ö.K. – drafting the article or revising it critically for important intellectual content; S.U., E.A., K.Ö.K – final approval of the version to be published.

Conflict of interest
None declared.

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Informed consent
The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

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