

Primary percutaneous coronary intervention for a left main bifurcation lesion without stenting using excimer laser with optical coherence tomography guidance: a case report

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Background

Optimal strategy for treating bifurcation lesions or lesions with large thrombus in left main disease remains elusive. Excimer laser coronary angioplasty (ELCA) is a therapeutic option for thrombotic lesions in acute coronary syndrome.

Case summary

A 68-year-old man with chest pain was transferred to our emergency department, and subsequently diagnosed as inferior ST-segment elevation myocardial infarction (STEMI). Emergent coronary angiography revealed a 75% stenosis in the left main trunk (LMT). Optical coherence tomography (OCT) showed massive thrombus at the distal LMT to the ostial left anterior descending artery (LAD) and left circumflex artery (LCx). ELCA was performed in the three directions from LMT to proximal LAD, proximal LCx, and obtuse marginal branch. OCT after ELCA showed reduction of thrombus and no apparent plaque rupture or calcification, implying that coronary thrombosis was caused by OCT-defined plaque erosion. Intracoronary electrocardiogram of the LCx showed ST-segment elevation which corresponded to inferior ST-segment elevation, whereas no intracoronary electrocardiogram ST-segment elevation was detected for LAD. Taking all of the data including angiographic appearance, OCT-derived residual lumen size and residual thrombus volume, and strategic options into consideration, we completed percutaneous coronary intervention without stent deployment. He has been free from any cardiac events thereafter for 8 months.

Discussion

Optimal strategy of coronary intervention for bifurcation lesions, especially LMT bifurcations, remains elusive. ELCA may have a potential to safely reduce intracoronary thrombus in patients presenting with acute coronary syndrome with OCT guidance.

Keywords

Excimer laser coronary angioplasty • Left main disease • Bifurcation • Plaque erosion • Stentless • Case report

Learning points

- Morphological assessment of the culprit lesion by optical coherence tomography (OCT) is helpful for deciding intervention strategy.
- Excimer laser coronary angioplasty can safely reduce intracoronary thrombus.
- Primary percutaneous coronary intervention can be safely performed without stent deployment using excimer laser with guidance of OCT in patients with ST-segment elevation myocardial infarction and heavy thrombus burden.

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Introduction

Devices including stents and debulking devices used in coronary intervention have been substantially improved in recent decades. Implantation of new-generation drug-eluting stents is recommended in primary percutaneous coronary intervention (PCI) for acute coronary syndromes (ACS).¹ However, optimal PCI strategy for left main trunk (LMT) bifurcation lesions and lesions with large thrombus remains elusive.

We present a case with a diagnosis of inferior ST-segment elevation myocardial infarction (STEMI) with a culprit lesion of LMT who was treated with excimer laser coronary angioplasty (ELCA) without stenting with optical coherence tomography (OCT) guidance.

Timeline

| Time | Events |
|--------|---|
| Day 1 | |
| 11:00 | The patient felt sudden-onset chest pain |
| 12:12 | He was transferred to our emergency department and diagnosed as inferior ST-segment elevation myocardial infarction |
| 12:30 | Emergent coronary angiography (CAG) showed 75% stenosis in the distal left main trunk (LMT). Optical coherence tomography (OCT) showed massive thrombus in the distal LMT, extended to the ostial left anterior descending artery (LAD) and left circumflex artery (LCx). Excimer laser coronary angioplasty was performed in the three directions of LMT to proximal LAD, proximal LCx, and obtuse marginal branch |
| Day 2 | Peak post-percutaneous coronary intervention CK was 861 IU/l. He started cardiac rehabilitation |
| Day 9 | Cardiac magnetic resonance perfusion imaging showed no myocardial ischaemia induction |
| Day 11 | Follow-up CAG and OCT showed potentially organized thrombus but no significant luminal narrowing |
| Day 13 | He discharged in favourable clinical course |

Case presentation

A 68-year-old man felt sudden-onset chest pain when he was playing golf, and he was transferred to our emergency department. He had a past medical history of hypertension and dyslipidaemia. He had a blood pressure of 183/110 mmHg, a heart rate of 82 b.p.m., and oxygen saturation of 100% on room air at arrival. On physical examination, he had regular cardiac rhythm with no heart murmurs. The laboratory data showed an elevation of high-sensitivity cardiac troponin-I up to 70 ng/l (99th percentile value of 34.2 ng/l for male, coefficient of variation of 3.5%, ARCHITECT i2000SR STAT hs-cTnI assay, Abbott Laboratories, North Chicago, IL, USA). The electrocardiogram showed an elevation of ST-segment in leads II, III, aVF, and V5–6. Transthoracic echocardiogram showed mild hypokinesis of

inferior wall with preserved left ventricular systolic function with an ejection fraction of 70%. Based on a diagnosis of Killip Class I inferior STEMI, 200 mg of aspirin was administered and he was immediately transferred to our catheterization laboratory.

Emergent coronary angiography (CAG) showed a 75% stenosis with filling defect in the distal LMT (Figure 1). Primary PCI was indicated and 20 mg of prasugrel was administered. Intracoronary electrocardiogram of the left circumflex artery (LCx) showed ST-segment elevation, whereas not for the left anterior descending artery (LAD) (Figure 2). OCT imaging showed massive thrombus in the distal LMT extended to the ostial LCx and the LAD (Figure 3). Thrombus vaporization with ELCA using a 0.9 mm catheter in the three directions of LMT to proximal LAD, proximal LCx, and obtuse marginal branch was performed. OCT examination in the LAD and LCx after ELCA showed a significant reduction of thrombus and preserved lumen size (Figure 4). Although the intimal flap potentially caused by ELCA procedure was observed, no apparent plaque ruptures or calcified nodules were detected. Since his symptom was relieved with accompanying TIMI flow Grade III and the resolution of ST-segment elevation in the inferior leads, we decided to complete the procedure without stenting to avoid bifurcation-related complicated PCI procedure such as the two-stent strategy. Peak post-PCI creatine kinase was 861 IU/l. He started cardiac rehabilitation on Day 2. Cardiac magnetic resonance imaging on Day 9 showed a small inferior late gadolinium enhancement and no myocardial ischaemia induction. Follow-up CAG on Day 11 showed no angiographic restenosis (Figure 5a). OCT during the follow-up CAG showed potentially organized thrombus and residual intimal flap, but no significant luminal narrowing of the culprit lesion (Figure 5b). Since no stent was implanted and he was considered to have a moderate bleeding risk (HAS-BLED score of 2, PRECISE-DAPT score of 22), we decided to shorten the duration of dual antiplatelet therapy (DAPT). DAPT with aspirin and prasugrel was administered for 6 weeks, and prasugrel as a single antiplatelet therapy has been continued. Optimal medical treatment including high dose statin, beta blocker, and angiotensin-converting enzyme inhibitors has been administered and he has been free from any cardiac events for 8 months after the index primary PCI.

Discussion

We reported a case of inferior STEMI with a culprit lesion of LMT, who was treated with ELCA without stenting. To the best of our knowledge, this is the first report of a case treated with ELCA for STEMI with a culprit lesion of LMT and completed without stenting by OCT guidance.

Best strategy of primary PCI for bifurcation lesions, especially LMT bifurcations, remains elusive. In general, two-stent strategy showed worse long-term clinical outcome compared with one-stent strategy.^{2,3} Intracoronary electrocardiogram has been reported to help detection of regional myocardial ischaemia and viability.⁴ In the present case, the information obtained from intracoronary electrogram helped us determine the culprit lesion and viable myocardial territory. For the lesions with a large amount of thrombus, intervention has high risks of distal embolization. Previous reports have failed to show the superiority of routine thrombectomy to reduce the clinical

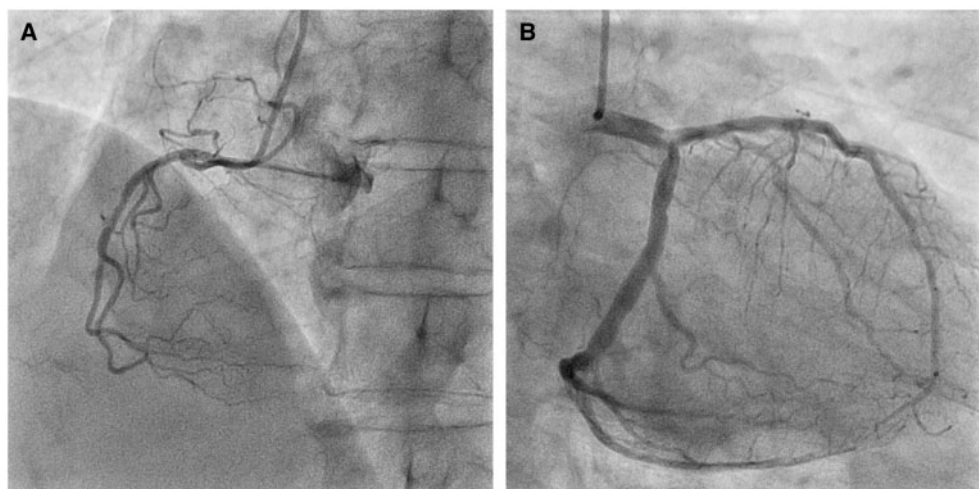


Figure 1 Pre-intervention coronary angiograms. (A) Right coronary artery. (B) Left coronary artery.

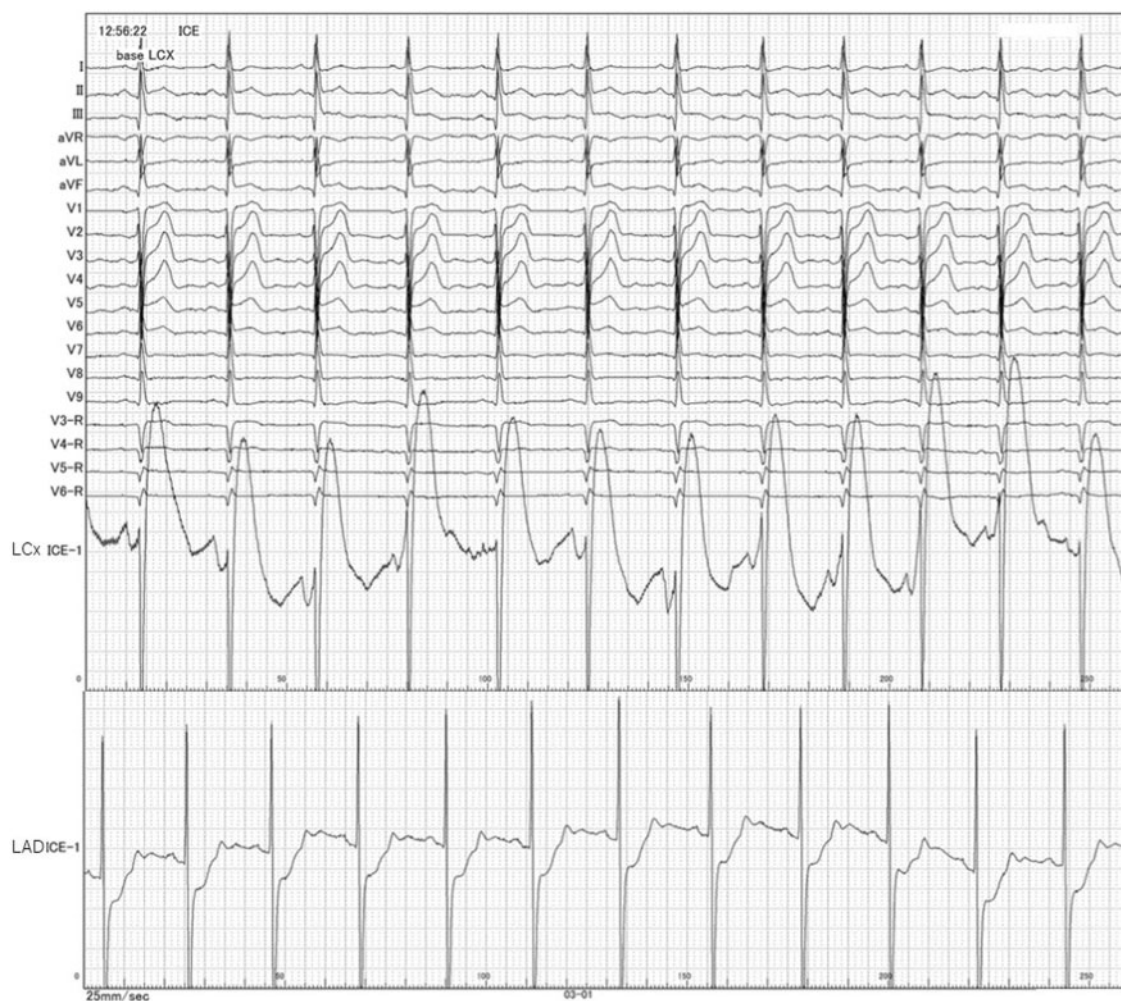


Figure 2 Superficial and intracoronary electrocardiogram. Superficial electrocardiogram shows ST-segment elevation in leads II, III, aVF, and V5–6. Intracoronary electrocardiogram of the left circumflex artery shows ST-segment elevation, and intracoronary electrocardiogram of the left anterior descending artery shows ST-segment depression.

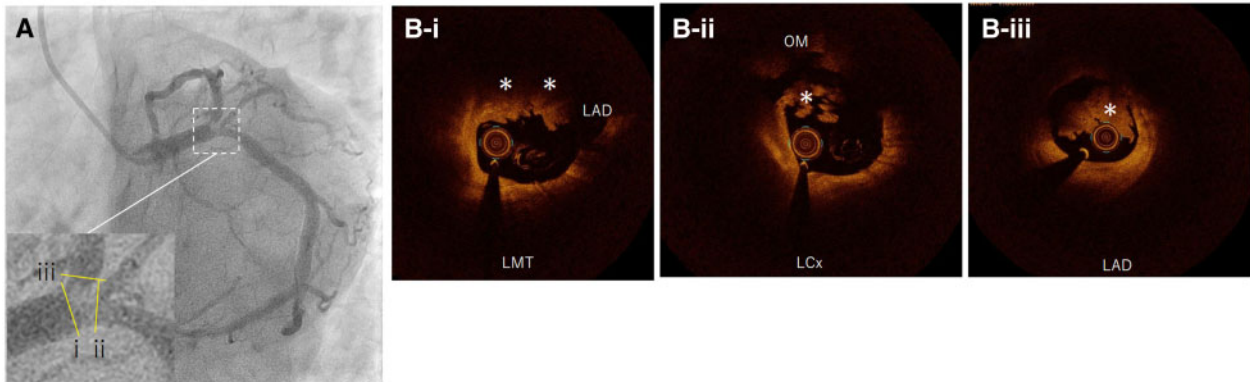


Figure 3 Pre-intervention coronary angiogram (A) and optical coherence tomography images (B). (A) Coronary angiogram reveals 75% stenosis with filling defect in the distal left main trunk. (B) Optical coherence tomography images show massive thrombus (asterisk) in the distal left main trunk (i) extending to the proximal left circumflex artery (ii) and the proximal left anterior descending artery (iii). LAD, left anterior descending artery; LMT, left main trunk; OM, Obtuse marginal branch.

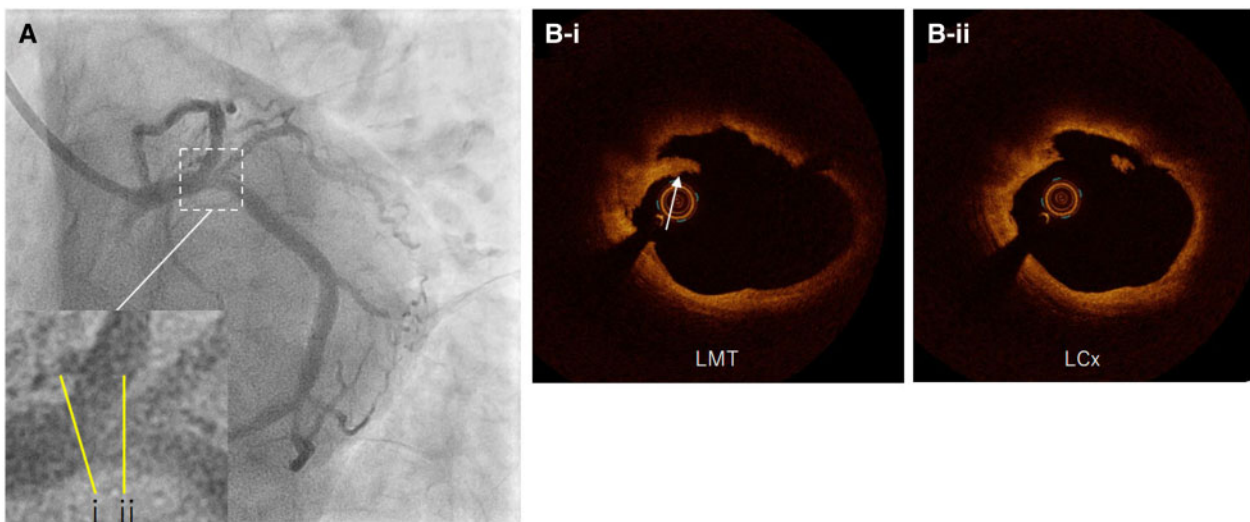


Figure 4 Coronary angiogram (A) and optical coherence tomography images (B) after excimer laser coronary angioplasty. (A) Coronary angiogram shows TIMI flow Grade III. (B) Optical coherence tomography reveals intimal flap (arrow) in the distal left main trunk (i) and a significant reduction of thrombus (ii). LCx, left circumflex artery; LMT, left main trunk.

events such as cardiovascular death, recurrent myocardial infarction, cardiogenic shock, or heart failure.⁵ ELCA may provide a potential solution to treat acute coronary thrombosis. The advantage of ELCA for ACS lesions is rapid removal of the thrombus with vaporization of procoagulant reactants, the reduction of the risk of distal embolization, and debulking of underlying plaque. Several studies have reported high technical success rates (>90%) of ELCA with low rates of complications such as slow/no-reflow and distal embolization in patients with ACS.⁶⁻⁸ A recent study showed the feasibility of optimal antiplatelet therapy without stenting in patients with ACS caused by OCT-derived plaque erosion.⁹ In this case, based on the repeated assessments with OCT imaging of the culprit lesion during

ELCA-supported primary PCI and at Day 11 after the index procedure, we safely completed stentless primary PCI strategy. Of note, DAPT duration in this case has not been in accordance with the current ESC guidelines¹ and the optimal antiplatelet therapy for cases with bleeding risks treated with ELCA should be determined in the future studies.

Conclusion

This case showed that ELCA can be safely used for ACS-culprit LMT lesion with guidance of OCT imaging.

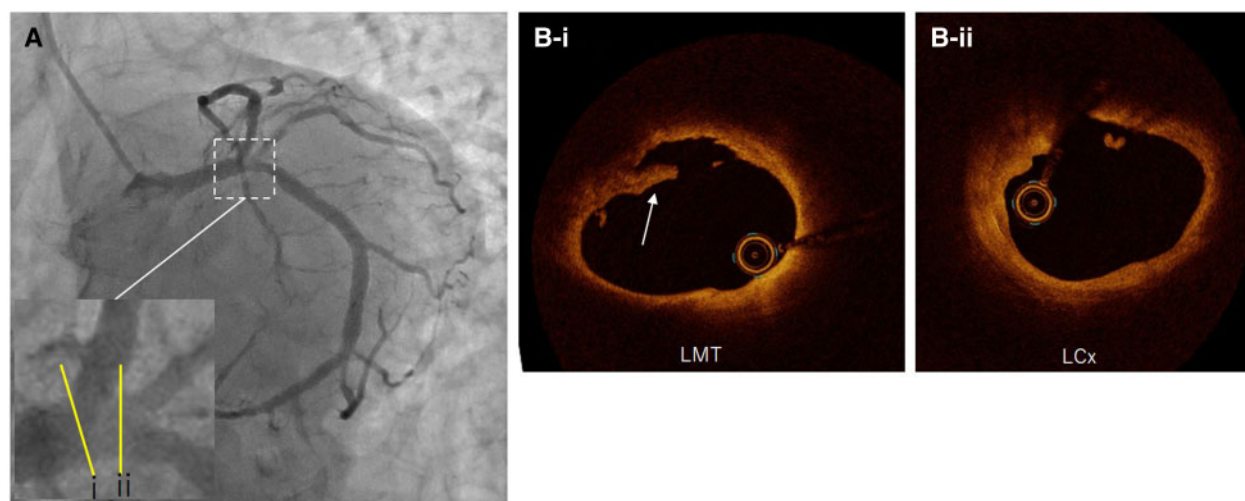


Figure 5 Follow-up coronary angiogram (A) and optical coherence tomography images (B). (A) Coronary angiogram shows no angiographic restenosis. (B) Optical coherence tomography shows a presence of potentially organized thrombus and residual intimal flap (arrow) in the distal left main trunk. LCx, left circumflex artery; LMT, left main trunk.

Lead author biography



Masahiro Hada is a clinical fellow in the Department of Cardiovascular Medicine of Tsuchiura Kyodo General Hospital. His main research interest is clarifying the underlying mechanisms of acute coronary syndromes based on plaque morphologies using intracoronary imaging modalities.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

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Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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