


CASE REPORT

Minimization of door-to-balloon time for ST-elevation acute myocardial infarction: a case report

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Key Clinical Message

It is of utmost importance to minimize the door-to-balloon time for the initial treatment of ST-elevation acute myocardial infarction. In this case report, we made all kinds of efforts to minimize procedures in the emergency department (ED minimization) as well as in the catheter laboratory without sacrificing safety.

Keywords

Door-to-balloon time, percutaneous coronary intervention, ST-elevation myocardial infarction.

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Introduction

It is of utmost importance to minimize total ischemic time for the initial treatment of ST-elevation acute myocardial infarction (STEMI). Clinical guidelines regarding STEMI recommend that first medical contact (FMC) to device time should be within 90 min [1]. The door-to-balloon (D2B) time, which is the time from hospital arrival to device time, should also be minimized to improve the outcomes of STEMI patients. Recent analysis from National Cardiovascular Data Registry including 146,940 patients suggests shorter patient-specific D2B times were closely associated with better in-hospital outcomes as well as with better 6 months outcomes [2]. Moreover, in the management of STEMI patients with a prehospital ECG, the emergency department (ED) could be skipped (ED bypass), and STEMI patients could be directly transported to the catheter laboratory [3]. Here, we report a case of STEMI treated with the shortest D2B time to discuss how we can minimize the D2B time for better patients outcomes.

Case Report

A 62-year-old man, whose risk factors were diabetes mellitus, dyslipidemia, and hypertension, was transferred to our medical center from a local clinic with a tentative diagnosis of STEMI. ECG showed ST elevation in I, aVL, and V1-V6 leads, and reciprocal change in III and aVF leads (Fig. 1). We quickly performed transthoracic echocardiography (TTE) to rule out mechanical complications such as ventricular septal perforation, cardiac tamponade, and aortic dissection. We did not take enough time to evaluate regional wall abnormalities. Chest X-ray revealed no pulmonary congestion and no dilatation of superior mediastinum. Based on ST elevation in the pre-hospital ECG before interhospital transfer, our catheter laboratory had been activated in advance. We performed emergent coronary angiography (CAG) via right radial artery using 6 Fr sheath. First of all, we checked right coronary artery using diagnostic catheter and confirmed that there was no stenosis in right coronary artery. Then, we performed CAG for left coronary artery (LCA) using a guiding catheter (Mach 1 6Fr JL3.5ST, Boston Scientific,

Natick, MA) instead of using a diagnostic catheter for LCA. CAG revealed total occlusion of the proximal segment of left anterior descending coronary artery (LAD) (Fig. 2). Because we used the guiding catheter for CAG, we could start percutaneous coronary intervention (PCI) immediately following CAG. A conventional guide wire (SION blue, ASAHI INTECC, Nagoya, Japan) easily passed the lesion, and a 2.0×15 mm semi-compliant balloon (IKAZUCHI, KANEKA, Osaka, Japan) was inflated, which promptly restored coronary flow. As a result, the D2B time for this case was 26 min. We deployed a 2.5×20 mm Promus PREMIER (Boston Scientific Co.) with intravascular ultrasound guidance and obtained thrombolysis in myocardial infarction (TIMI) flow grade 3 (Fig. 3). Final IVUS showed neither malapposition nor dissection. We prescribed optimal medical therapy including dual antiplatelet therapy, statin, β -blocker, and angiotensin-converting enzyme inhibitor. His peak CPK and peak CPK-MB levels were 2857 and 340 IU/dL, respectively. ECG showed ST resolution in V1-5 leads on day 2nd (Fig. 4). He received cardiac

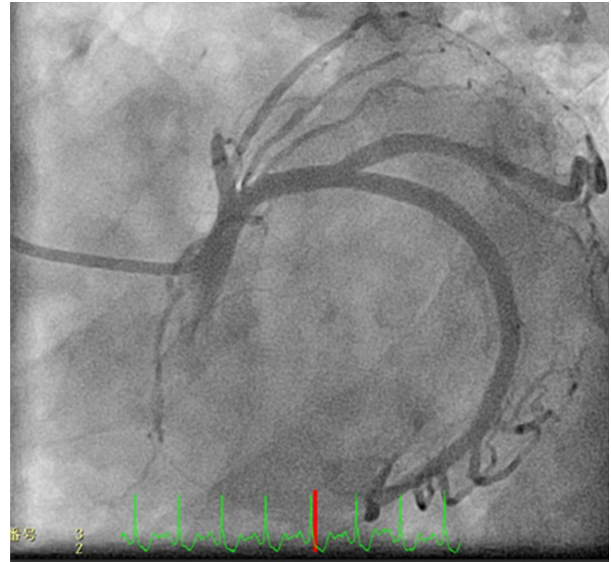


Figure 2. Initial angiography. Coronary angiogram using a guiding catheter revealed total occlusion of the proximal segment of left anterior descending coronary artery (LAO 54, CAU 30).

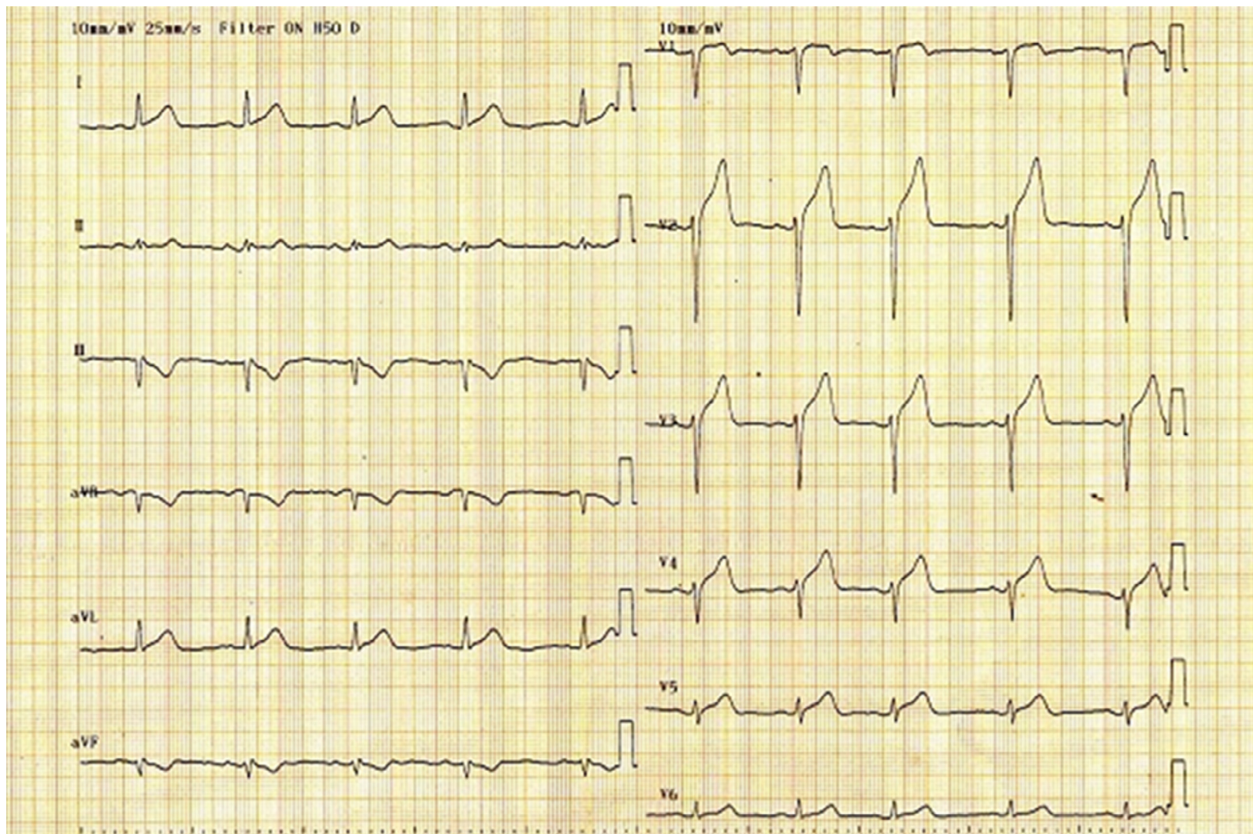


Figure 1. ECG on admission. ECG shows ST elevation in I, aVL, and V1-V6 leads, and reciprocal change in III and aVF leads.

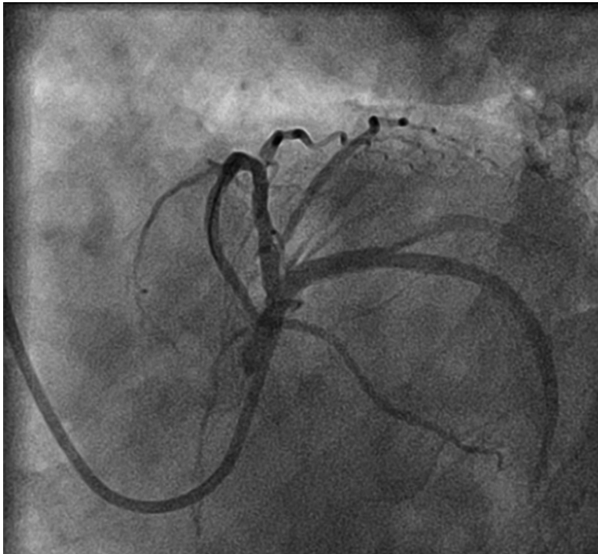


Figure 3. Final angiography. Final coronary angiogram showed TIMI-3 grade flow of the left anterior descending coronary artery following stent implantation (LAO 54, CAU 30).

rehabilitation from day 2nd, and discharged hospital without complications on day 5th.

Discussion

In this case report, we could achieve the shortest D2B time (only 26 min), which was less than the half of

median D2B time (60–63 min) in Japanese CCU network and US National Cardiovascular Data Registry [2, 4]. Although we understand the strong association between short D2B time and better outcomes, it is not easy to minimize D2B time until <30 min. We made all kinds of efforts to minimize D2B time without sacrificing safety.

First, as we put the X-ray cassette on the bed in the emergency room before patient’s arrival, we could perform chest X-ray immediately just after patient’s arrival. Because STEMI is one of complications in Type A aortic dissection (approximately 3% of Type A aortic dissection) [5, 6], we should rule out Type A aortic dissection before we start CAG. Second, we shortened time for TTE. Unlike conventional TTE, the purpose of TTE before primary PCI was to identify mechanical complications such as pericardial effusion, papillary muscle rupture, ventricular septal perforation, and aortic dissection, which needs surgical intervention rather than PCI [7–10]. Therefore, when electrocardiogram clearly shows ST elevation that suggests STEMI, we do not need to check precise wall motion abnormality before primary PCI [3]. Third, we performed CAG for LCA using a 6Fr guiding catheter, which allowed us to switch from CAG to PCI without delay. For this procedure, we need to start CAG for non-culprit vessel using a diagnostic catheter and then perform CAG for culprit vessel using a guiding catheter. Furthermore, we used radial access for emergent CAG and PCI. Recent studies including multicenter randomized trial showed benefit of radial approach in

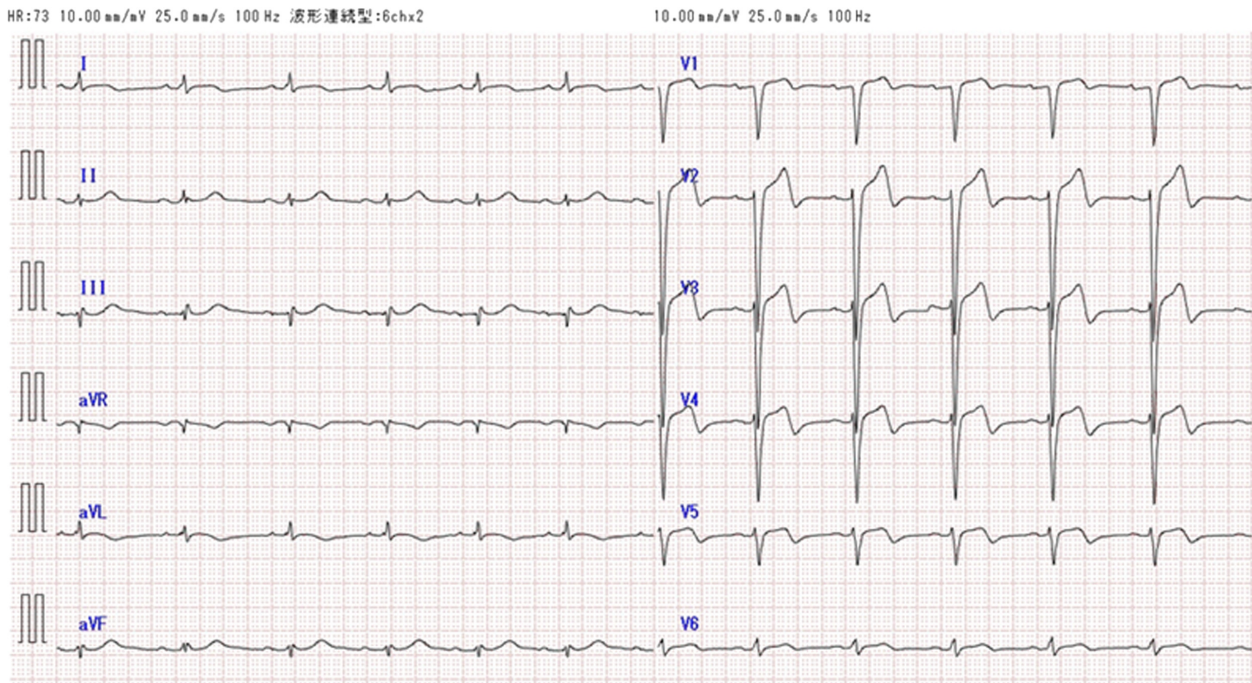


Figure 4. ECG after PCI (on day 2). ECG showed ST resolution in V1-5 leads.

patients with acute coronary syndrome [11, 12]. It would be important to select radial access for better patient's outcomes, when radial arteries are well palpable in patients with STEMI. Finally, although we did not bypass emergency room, all staffs including cardiologists, nurses, radiological technologists, and medical engineers made every effort to bring the patient from the emergency room to the catheter laboratory and to set up the catheter laboratory and devices synergistically, which is the team building for STEMI.

Although it is important to shorten D2B time, we should be careful not to miss other severe diseases such as aortic dissection or pulmonary thromboembolism [3, 13, 14]. If there are findings suggesting aortic dissection such as mediastinal and/or aortic widening in the initial chest X-ray or enlargement of ascending aorta in the initial TTE [15], we should switch to ED evaluation with further modalities such as computed tomography before primary PCI without hesitation. Furthermore, while ED bypass for patients with prehospital ECG is the latest concept to minimize D2B time [3], there would be a potential risk to miss other critical diseases in ED bypass. It would be safer approach to minimize procedures in the emergency department (ED minimization) than to skip the emergency department (ED bypass) even for patients with prehospital ECG.

In conclusion, it is possible to minimize D2B time to <30 min without sacrificing safety. Team building including cardiologists, nurses, radiological technologists, and medical engineers together with specific tips for primary PCI is the cornerstone for shortening D2B time.

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Authorship

NA, KS, and HF: drafted the manuscript. KY, YT, HW, and SM: revised the manuscript critically for important intellectual content.

Conflict of Interests

Dr. Sakakura received speaking honorarium from Abbott Vascular, Boston Scientific, Medtronic Cardiovascular, and Terumo; and served as a consultant for Abbott Vascular and Boston Scientific.

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