

# Primary percutaneous coronary intervention without stenting using excimer laser and manual thrombectomy in STEMI with duodenal ulcer perforation: a case report

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## Background

ST-segment elevation myocardial infarction (STEMI) and peptic ulcer perforation are both medical emergencies that require urgent intervention. In case that these time-sensitive medical emergencies present concomitantly, it remains unclear which one should be treated first.

## Case summary

An 85-year-old man with melaena, epigastric pain, and severe anaemia was transferred to our emergency department and diagnosed as having inferior STEMI based on electrocardiogram. Emergency coronary angiography (CAG) revealed severe stenosis with thrombus in the proximal right coronary artery. Immediate oesophagogastroduodenoscopy and abdominal computed tomography detected the presence of duodenal ulcer perforation. Primary percutaneous coronary intervention (PCI) without stenting using excimer laser coronary angioplasty and manual thrombectomy was performed under intravascular ultrasound (IVUS) guidance to avoid dual antiplatelet therapy (DAPT). After successful PCI, the perforated viscus was surgically repaired with a laparoscopic omental patch. On Day 7, endoscopic haemostasis treated the oozing of blood from the duodenal ulcer. On Day 21, follow-up CAG and IVUS showed residual stenosis with organized thrombus in the culprit lesion, in which a drug-coated stent was directly implanted. He was discharged with a favourable clinical course on Day 23.

## Discussion

We judged that PCI should take precedence over the surgical repair of perforated duodenal ulcer in our case since STEMI was an immediate life-threatening compared to the perforated viscus which had no active exsanguination. Excimer laser coronary angioplasty with manual thrombectomy might be an adequate option to avoid stent deployment and subsequent DAPT in such complex scenarios.

## Keywords

ST-segment elevation myocardial infarction • Duodenal ulcer perforation • Primary percutaneous coronary intervention • Excimer laser coronary angioplasty • Drug-coated stent • Case report

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## Learning points

- In case that two time-sensitive medical emergencies—ST-segment elevation myocardial infarction and duodenal ulcer perforation—present simultaneously, percutaneous coronary intervention could take precedence over the surgical repair of perforated viscus.
- Excimer laser coronary angioplasty with manual thrombectomy might be an acute management of acute coronary syndrome patients with high bleeding risk to avoid stent deployment and subsequent dual antiplatelet therapy.

## Introduction

ST-segment elevation myocardial infarction (STEMI) is a medical emergency. Early reperfusion using primary percutaneous coronary intervention (PCI) has been reported to decrease STEMI mortality, which is also mentioned in the ESC guideline.<sup>1,2</sup> Peptic ulcer perforation is a fatal complication of peptic ulcer disease, and the delayed treatment is an independent predictor for 30-day mortality.<sup>3</sup> ST-segment elevation myocardial infarction and duodenal ulcer perforation share some symptoms, e.g. epigastric pain, which makes diagnosing both simultaneously more challenging. We encountered a case suffering concomitantly from these two time-sensitive medical emergencies, which forced us to decide which one to treat first.

## Timeline

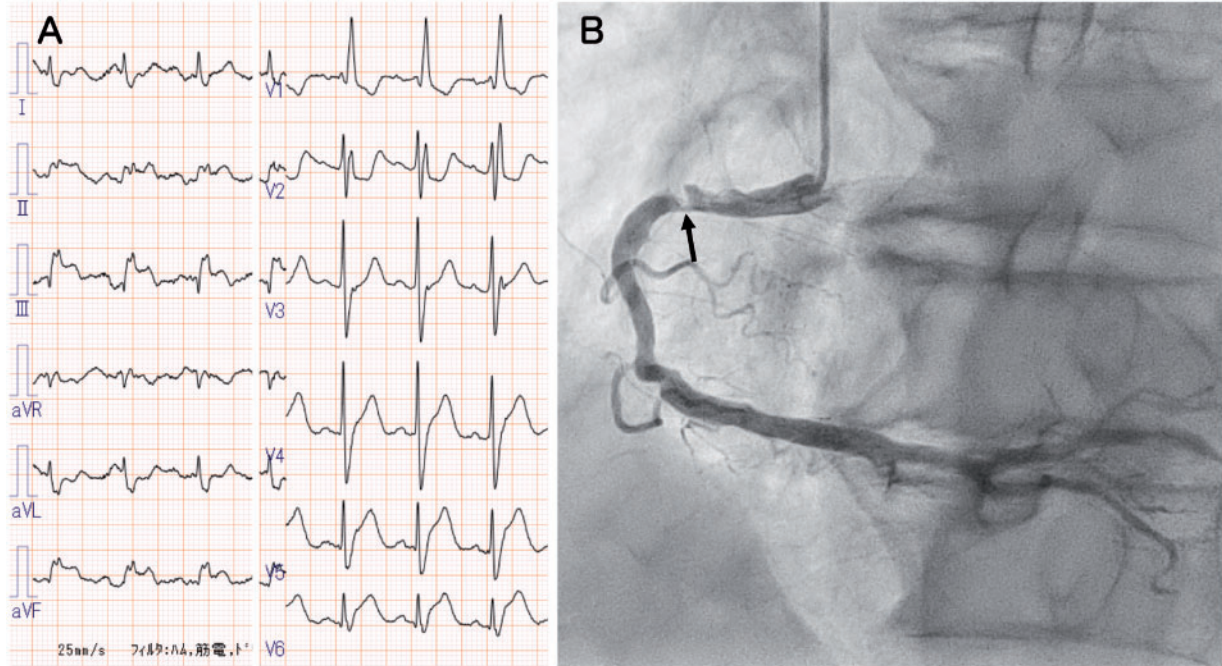
Time	Events
Day 1	
06:00	The patient felt epigastric pain
10:35	He was transferred to our emergency department and diagnosed with inferior ST-segment elevation myocardial infarction
11:45	Emergency coronary angiography (CAG) revealed severe stenosis in the proximal right coronary artery
12:10	Esophagogastroduodenoscopy and abdominal computed tomography showed duodenal ulcer perforation
14:45	Primary percutaneous coronary intervention without stenting using excimer laser and manual thrombectomy was performed under intravascular ultrasound guidance
16:30	The perforated duodenal ulcer was repaired with a laparoscopic omental patch
Day 2	Post-operatively, the patient recovered well and peak creatine kinase level was 634 IU/L
Day 7	Endoscopic haemostasis treated the oozing of blood from the duodenal ulcer
Day 21	Follow-up CAG showed residual stenosis with organised thrombus in the culprit lesion, in which a drug-coated stent was directly implanted
Day 23	He was discharged with a favourable clinical course
12 months	He had no symptom related to cardiac events and recurrent bleeding

## Case presentation

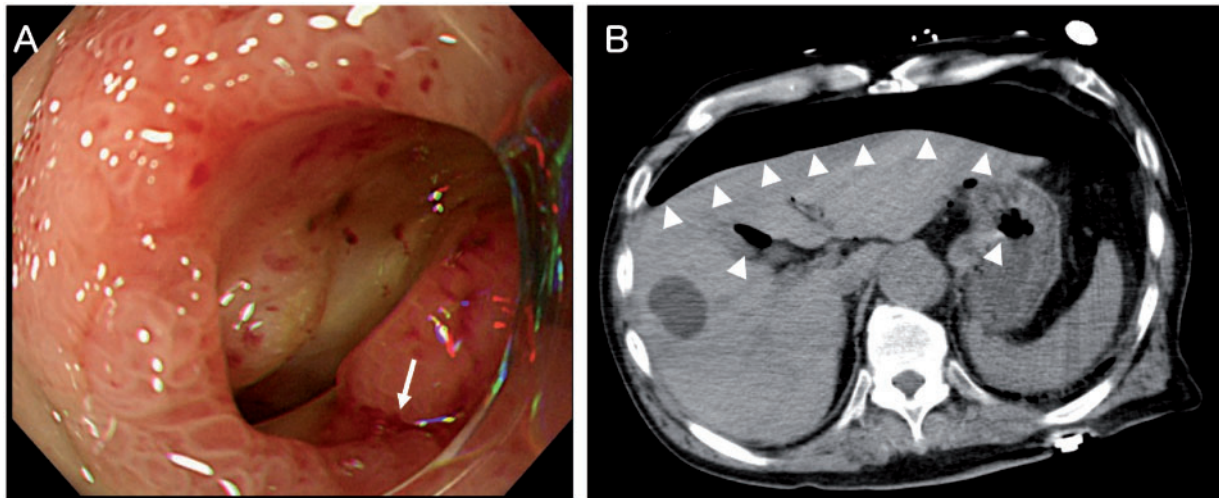
An 85-year-old Japanese man was transferred to our emergency department with a complaint of melaena for 3 days and epigastric pain for 4 h. He had a past medical history of hypertension, chronic kidney

disease, and duodenal ulcer. At admission, he was on calcium channel blocker, angiotensin receptor blocker, and  $\beta$ -blocker to control hypertension, but had no treatment for healed duodenal ulcer. He had a blood pressure of 130/60 mmHg, heart rate of 96 b.p.m., and oxygen saturation of 100% on room air at arrival. Physical examination showed significant facial and conjunctival pallor and a rigid abdomen with diffuse abdominal tenderness. There were no additional heart sounds on auscultation and no pulmonary rales. Laboratory findings revealed anaemia (Hb, 6.8 g/dL; lower limit of normal 13.5 g/dL), renal dysfunction (creatinine, 379  $\mu$ mol/L; upper limit of normal 97  $\mu$ mol/L), and elevations of both cardiac troponin I (14.21 ng/mL; upper limit of normal <0.1 ng/mL) and creatine kinase (CK) (449 IU/L; upper limit of normal 195 IU/L). Electrocardiogram (ECG) showed an elevation of ST-segment in leads II, III, and aVF (Figure 1A). Echocardiogram showed hypokinesis of inferior wall with preserved left ventricular systolic function and an ejection fraction of 69% (Supplementary material online, Video S1). He was immediately transferred to our catheterization laboratory based on a diagnosis of inferior STEMI. After the transfusion with two units of red blood cells was initiated, emergency coronary angiography (CAG) via the left radial artery revealed severe stenosis of the proximal right coronary artery with Thrombolysis in Myocardial Infarction (TIMI) 2 flow (Figure 1B and Supplementary material online, Video S2). Immediate oesophagogastroduodenoscopy demonstrated the recurrence of duodenal ulcer with perforation (Figure 2A), and abdominal computed tomography showed massive free intraperitoneal air (Figure 2B). Based on these findings, we discussed regarding the proper course of treatment, and unanimously agreed that primary PCI would take precedence over laparoscopic surgical repair of his perforated viscus.

The patient was intubated for the planned surgery and again transferred to our catheterization laboratory. After he received 4000 units of heparin without any antiplatelet agents, PCI was performed through the right radial artery. Intravascular ultrasound (IVUS) found intimal flap and intraluminal thrombus suspected of plaque rupture (Figure 3B and C and Supplementary material online, Video S3). Since we thought that performing excimer laser coronary angioplasty (ELCA) with aspirating shattered thrombi should be primarily performed prior to balloon dilation to avoid distal embolization, the thrombus was firstly vaporized multiple times using a 1.4-mm excimer laser. Subsequently, aspiration using a Thrombuster III thrombectomy catheter (6 Fr, Kaneka, Japan) obtained small amount of red thrombus, and dilation using a perfusion balloon (Ryusei, 3.0  $\times$  20 mm, Kaneka, Japan) was performed for 3 min twice (Supplementary material online, Video S4). Intravascular ultrasound after ELCA and long-time inflation showed a reduction of thrombus volume (Figure 3D) and preserved lumen size (Figure 3E and Supplementary material online, Video S5), respectively. As a result, TIMI 3 flow was restored (Figure 3F and Supplementary material online, Video S6), so that we completed the procedure without stenting.



**Figure 1** (A) Electrocardiogram shows inferior ST-segment elevation myocardial infarction. (B) Urgent coronary angiogram reveals severe stenosis in the proximal right coronary artery (black arrow).

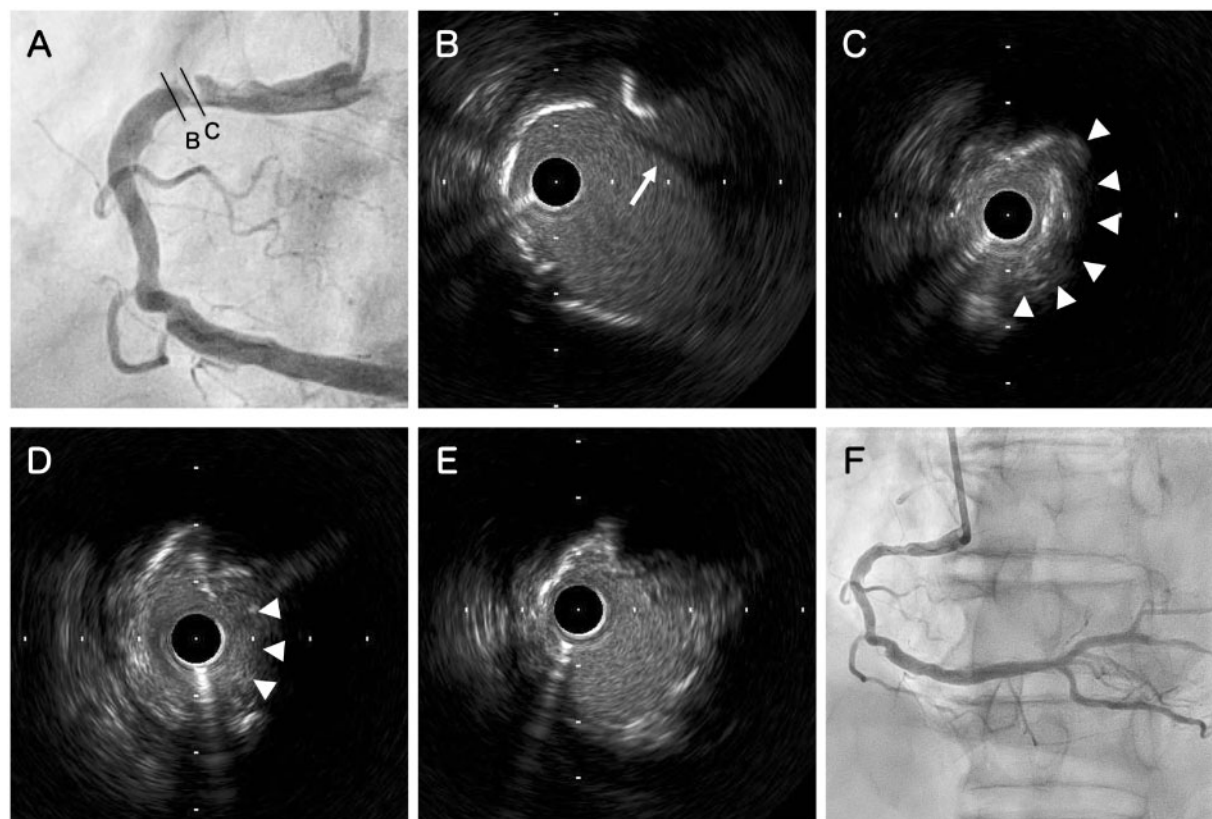


**Figure 2** (A) Oesophagogastroduodenoscopy shows duodenal ulcer (white arrow). (B) Abdominal computed tomography shows free intraperitoneal air (white arrowhead).

During the procedure, additional 2000 units of heparin and 22 mL of contrast medium were used.

The patient was then transferred directly to the operating room in a haemodynamically stable condition. Laparoscopic surgery found a

5-mm perforation in the duodenum, which was repaired with placing an omental patch. Post-operatively, the patient recovered well with peak CK level of 634 IU/L on Day 2. Electrocardiogram found that the inferior ST-segment elevation was partially resolved immediately



**Figure 3** (A) Coronary angiogram. Intravascular ultrasound shows intimal flap (white arrow) (B) and massive thrombus (white arrowhead) (C) in the culprit lesion. Intravascular ultrasound after excimer laser coronary angioplasty and long-time inflation show a reduction of thrombus volume (white arrowhead) (D) and preserved lumen size (E), respectively. (F) Final coronary angiography.

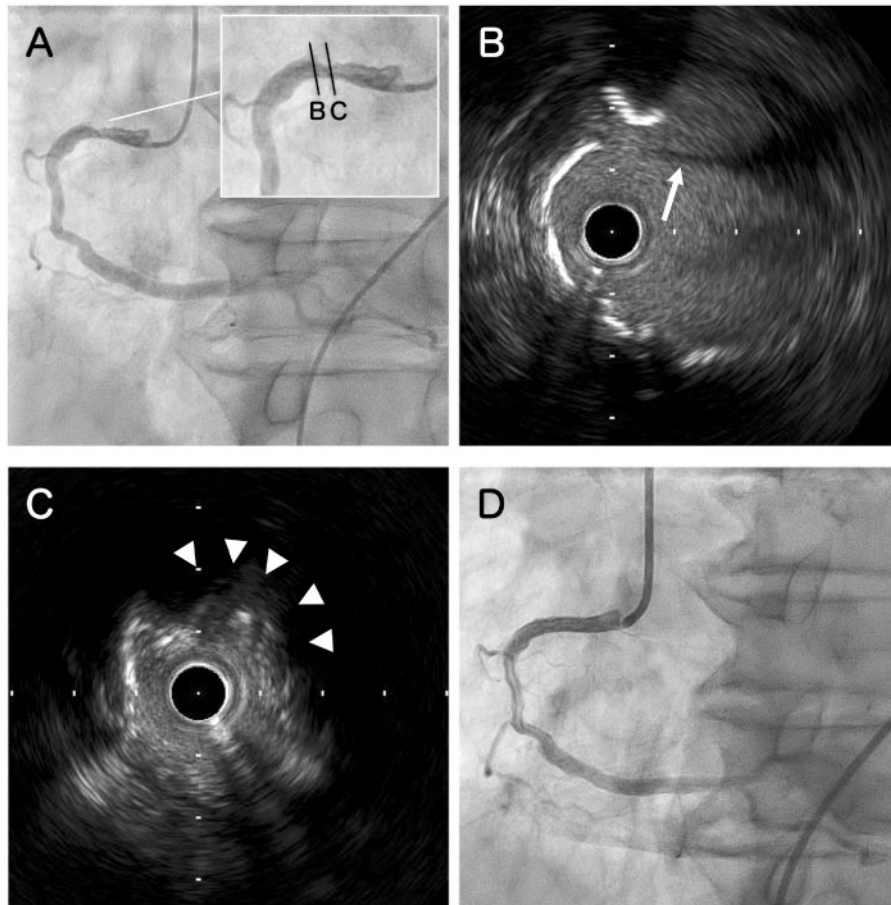
after PCI, but completely disappeared on Day 3. On Day 7, endoscopic haemostasis successfully treated the oozing of blood from the duodenal ulcer. After the improvements of both duodenal ulcer and renal function were confirmed, aspirin was started on Day 19. On Day 21, follow-up CAG and IVUS showed residual stenosis with organized thrombus in the culprit lesion (Figure 4A and C), and a drug-coated stent (BioFreedom, 3.5 × 18 mm, Biosensors Interventional Technologies, Singapore) was directly implanted after the loading of the standard dose of clopidogrel to reduce a future ischaemic risk (Figure 4D). He was discharged with a favourable clinical course on Day 23. Dual antiplatelet therapy (DAPT) was administered only for 4 weeks, and then clopidogrel as a single antiplatelet therapy and proton pump inhibitor have been continued. He had no clinical symptom regarding cardiac events and recurrent bleeding for more than 12 months after stent implantation.

## Discussion

ST-segment elevation myocardial infarction occurring simultaneously with duodenal ulcer perforation is an uncommon clinical scenario that could result in fatal consequences. Differentiating between STEMI and perforated viscus can also be quite challenging because these disorders often share the similar symptom. In fact, STEMI can

manifest clinically with epigastric complaints while perforated viscus can be accompanied by ischaemic changes on ECG.<sup>4</sup> Therefore, patients with these two concomitant pathologies may be easily misdiagnosed.<sup>5</sup> Nevertheless, a major concern in such a case is which disorder should be primarily treated. In 1994, Kırkcıyan et al.<sup>6</sup> reported a similar case when only ordinary balloon dilation, but not new technology like ELCA and thrombectomy was available at the point, and mentioned that surgical treatment was performed first. In contrast, another report suggested that PCI should be prioritized based on comprehensive data supporting superior outcomes of early revascularization for STEMI; however, in the latter case, the patient died of early stent thrombosis following the surgical repair.<sup>7</sup> In our case, the treatment of duodenal ulcer perforation would be also firstly considered. However, we decided to perform PCI first because the perforated viscus was associated with no evidence of active exsanguination while STEMI was an immediate life-threatening condition.

Several studies have demonstrated that ELCA exhibits high technical success rates with low rates of complications such as slow/no-reflow and distal embolization in patients with acute coronary syndrome (ACS).<sup>8,9</sup> A recent report also showed that a culprit lesion at left main bifurcation causing STEMI was safely treated using ELCA without stenting.<sup>10</sup> The main issue in our case was that the patient planned to have a surgery for perforated viscus and therefore should avoid antiplatelet drugs. We decided to select ELCA with IVUS



**Figure 4** (A) Follow-up coronary angiogram shows residual stenosis in the culprit lesion. Intravascular ultrasound shows residual intimal flap (white arrow) (B) and potentially organized thrombus (white arrowhead) (C). (D) Final coronary angiogram.

guidance to avoid stent deployment and subsequent DAPT as excimer laser induces thrombus dissolution and inhibits platelet aggregation.<sup>11</sup> We found that ELCA with thrombectomy made the culprit vessel patent without stenting.

Antiplatelet therapy is always accompanied with bleeding risk and ischaemic risk, and it remains controversial which issue should be primarily addressed. Recently, the ESC guideline recommends that bleeding risk should be firstly considered over thrombotic risk.<sup>12</sup> A current solution would be to use BioFreedom with benefit of short DAPT. A prospective randomized trial showed that BioFreedom was superior to bare-metal stent in both safety and efficacy endpoints in high bleeding risk (HBR) patients with 1-month DAPT, even in ACS patients.<sup>13</sup> Recent studies have shown that several types of drug-eluting stent (DES) were safe with short DAPT duration, suggesting that several options are currently available.<sup>14</sup> Currently, there is another attempt to use a single antiplatelet, P2Y12 inhibitor only, after DES implantation.<sup>15</sup> In order to establish the adequate antiplatelet therapy after PCI for HBR patients, future studies should be warranted.

## Conclusion

In case of simultaneous STEMI and perforated duodenal ulcer, STEMI should be treated first. Excimer laser coronary angioplasty with manual thrombectomy might be an acute management of ACS patients with HBR to avoid stent deployment and subsequent DAPT.

## Lead author biography



Hirokazu Yokoi was born in 1976 in Aichi, Japan. He received his medical training at Kyoto Prefectural University of Medicine. Currently, he is a director in the Department of Cardiology of Rakuwakai Otowa Hospital.

## Supplementary material

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

**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.

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**Conflict of interest:** none declared.

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