

Zero Contrast Coronary Intervention Using Intravascular Ultrasound Guidance in a Patient with Allergy to Contrast Medium

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The occurrence of allergy to iodinated contrast in certain patients may prevent the use of percutaneous coronary intervention (PCI) in such cases. We present a 53-year-old male with a history of allergic reaction to iodinated contrast who successfully underwent intravascular ultrasound (IVUS) guided PCI. Stent size was determined based on IVUS. After PCI, stent expansion and a lack of edge dissection or incomplete apposition were confirmed by IVUS. Thus, PCI without contrast injection under IVUS may be feasible in selected patients with allergy to iodinated contrast.

Key words: Contrast allergy, percutaneous coronary intervention, intravascular ultrasound

INTRODUCTION

Contrast dye is generally regarded as a non-toxic substance which is required for the performance of coronary angiography and coronary vascular intervention. However, contrast dye has side effects such as contrast induced nephropathy or allergic reaction.

Contrast-induced nephropathy (CIN) is one of the most common complications following coronary angiography (CAG) and percutaneous coronary intervention (PCI), especially among patients with chronic kidney disease (CKD) [1]. Patients complicated with CIN after PCI have been reported to have a poor prognosis and be at high risk of major adverse cardiac and cerebrovascular events (MACCE) in the long-term clinical course [2, 3].

One of the most important methods used for prevention of CIN is reduction of contrast volume [4-7]. Recently, intravascular ultrasound (IVUS) guided PCI has made it possible to minimize contrast volume, to levels far lower than prior thresholds.

Nonetheless, an allergic reaction such as anaphylactic shock can be caused by a small volume of contrast. The use of contrast dye is contraindicated in such patients. In this report, we performed IVUS guided zero contrast coronary intervention (PCI) in a patient with allergy.

CASE

A 53 year old male was admitted to our hospital for coronary angiography due to chest pain on effort. He presented with diabetes mellitus, and chronic atrial fibrillation since the age of 30 years. He had started maintenance hemodialysis for diabetic renal failure 2 years earlier. The EKG showed atrial fibrillation and poor R progression from V1 to V4. Chest X ray

showed cardiomegaly with cardiothoracic ratio of 55%. Echocardiography showed mild hypokinesis at the anterior wall, moderate mitral regurgitation with left ventricular diastolic diameter of 63 mm and ejection fraction of 47%. Assessment of left ventricular function using magnetic resonance imaging or scintigraphy was not performed. When coronary angiography was performed using 110 mL of iopamidol 370 (Konica Minolta, Tokyo, Japan), the mid left anterior descending coronary artery (LAD) showed 90% stenosis. Immediately after coronary angiography, severe multiform exudative erythema appeared throughout his body. When this was treated with fexofenadine 60mg b.i.d. and topical clobetasol propionate, skin condition was gradually normalized. Since it was difficult to repeat the use of contrast dye, we suggested coronary artery bypass grafting as a result of the heart team discussion. However, the patient refused bypass surgery and preferred coronary intervention without contrast dye. After his skin condition recovered, we performed IVUS guided zero contrast PCI 55 days after coronary angiography. We did not intend to use contrast dye but allergy prevention prophylaxis was performed using prednisolone 30 mg and chlorpheniramine 6 mg for 3 days. A 6 Fr sheath was inserted from the femoral artery. A 6 Fr XB guiding catheter (Cordis, USA) was inserted into the left coronary artery. Three guidewires were inserted into LAD (Route, Asahi Intech, Japan), D1 (Rinato, Asahi Intech) and D2 (Sion Blue, Asahi Intech). An IVUS catheter (Terumo, Japan) was used to assess the lesion, thereby marking the positions of the proximal and distal edges of the stent. A Promus stent (Boston Scientific, USA) 3.0 X 18 mm was implanted in the LAD, and post dilatation was then performed using a 3.25 X 8 mm balloon (Powered Lacrosse, Goodman, Japan) at 20 atm. Post IVUS

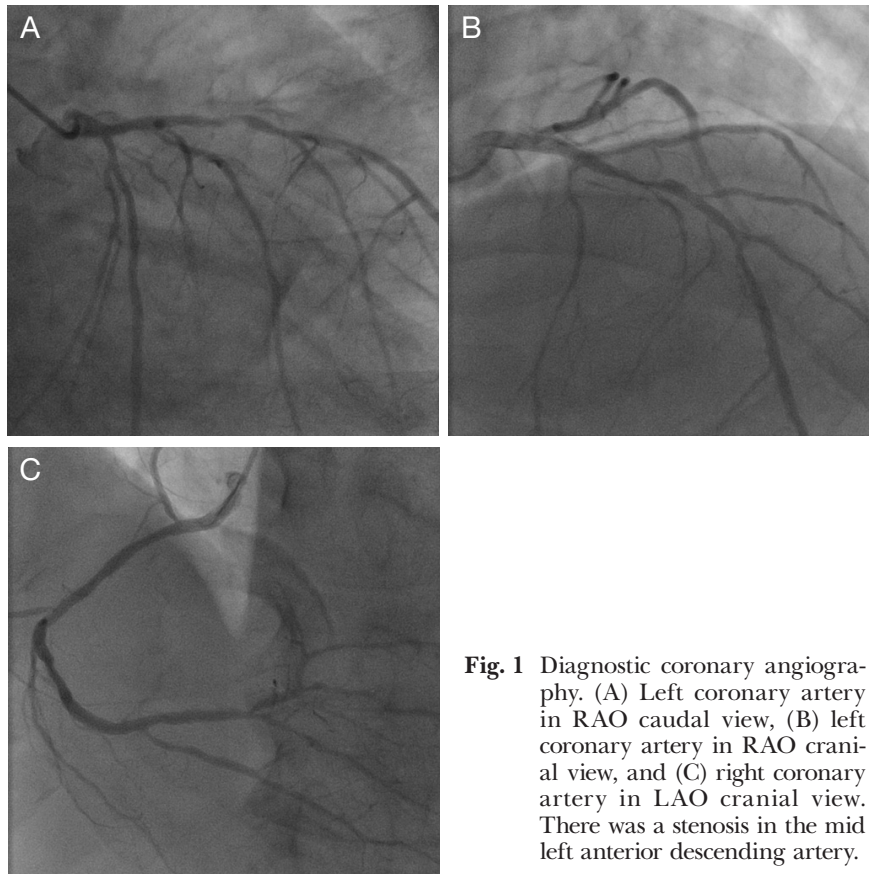


Fig. 1 Diagnostic coronary angiography. (A) Left coronary artery in RAO caudal view, (B) left coronary artery in RAO cranial view, and (C) right coronary artery in LAO cranial view. There was a stenosis in the mid left anterior descending artery.

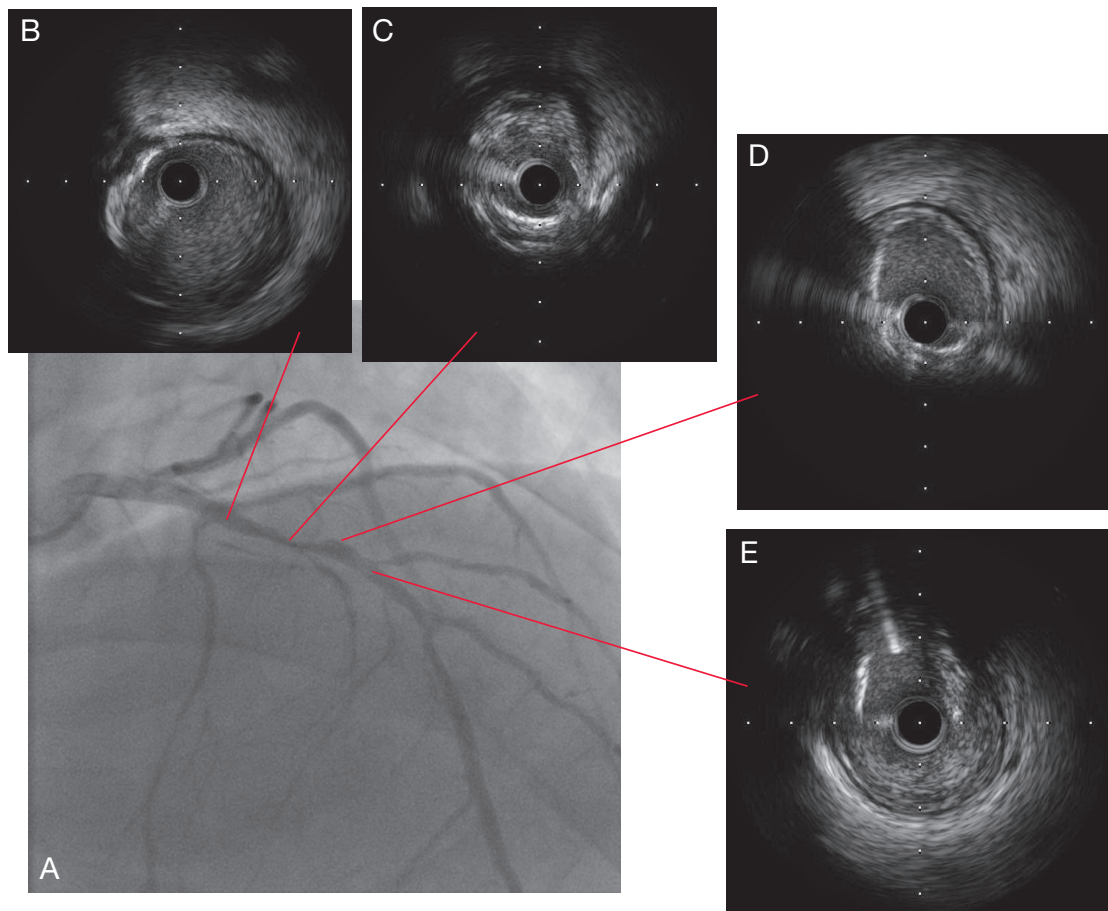


Fig. 2 Intravascular ultrasound (IVUS) findings before PCI. (A) Reference image of left coronary angiography taken during diagnostic angiography to indicate IVUS image position. (B) IVUS image at the proximal region, (C) in the middle of the stenosis showing calcium and atheromatous plaque, (D) at the distal region, and (E) far distal region at the bifurcation of the second diagonal branch.

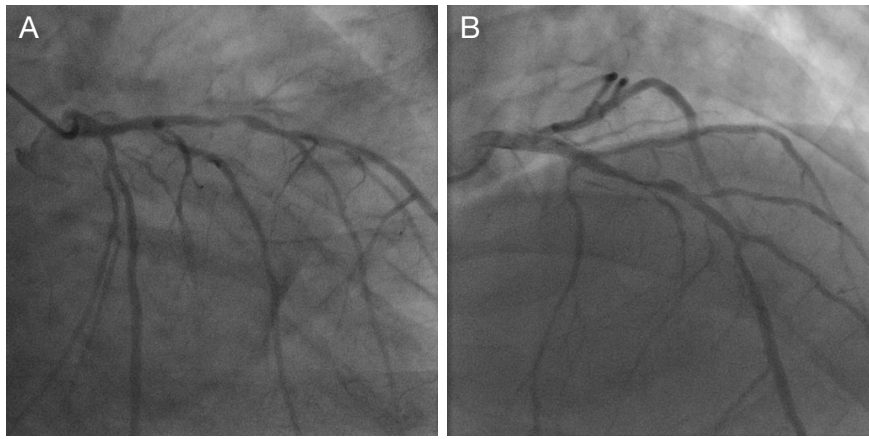


Fig. 3 (A) IVUS guided positioning of the stent, (B) stent implantation.

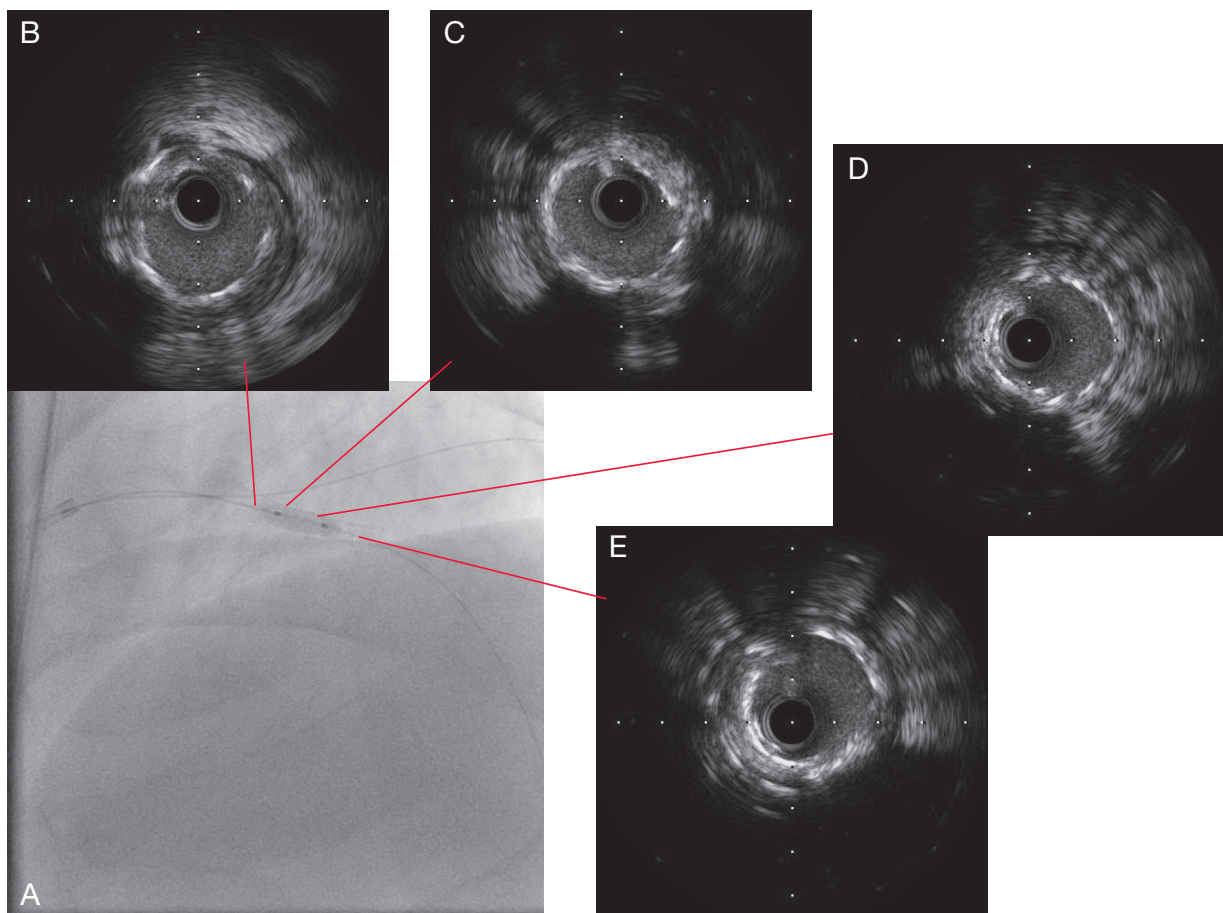


Fig. 4 IVUS findings after PCI. (A) Reference image of left coronary artery (B) IVUS image at the proximal region after stenting, (C) in the middle of the stenosis with full dilatation of the stent, (D) slightly distal to image C, (E) at the distal edge of the stent.

observation showed full stent expansion without edge dissection. We observed no change in vital signs or EKG. The patient was discharged from hospital the next day. His angina completely disappeared.

DISCUSSION

IVUS guided minimum contrast PCI has been reported to reduce levels of contrast dye and to prevent CIN in patients with chronic kidney disease following

PCI. However, in patients with allergy, reduction of contrast is not sufficient, and only its absence ensures prevention of the allergic reaction. Ali et al reported 31 cases of minimum contrast PCI (median contrast volume 13, IQR 12 – 15) without any complications [8]. Technically, it is possible to perform zero contrast PCI; however, several limitations of this approach should be noted. First, we cannot rule out guidewire perforation at the distal end of the coronary artery. An IVUS can

reveal proximal dissection; however, IVUS cannot reveal distal wire perforation. Second, when sudden vital deterioration occurs, this cannot readily be diagnosed. Based on these points, zero contrast for a patient with allergy is not a universally applicable PCI technique. Fortunately, this case showed no adverse reaction either during or after PCI. Careful consideration and evaluation is necessary [9]. In some special cases, zero contrast PCI can be safely performed as in the present case.

For patients with anaphylaxis against contrast dye, pre-medications using corticosteroids and H-1 antihistamine drugs are suggested. Six ST elevation myocardial infarction cases with previous contrast allergy underwent safe PCI procedure using emergency corticosteroids, H-1 and H-2 blockers [10]. In elective cases, zero contrast may be superior to using contrast if it can be performed safely.

CONCLUSION

We have reported a successful case using IVUS guided zero contrast PCI for a patient with allergy to contrast medium. To our knowledge, this is the first report of zero contrast PCI in a patient with contrast allergy. Careful assessment is necessary before PCI because there are many limitations of zero contrast PCI.

REFERENCES

- 1) Abe M, Kimura T, Morimoto T, Furukawa Y, Kita T. Incidence of and risk factors for contrast-induced nephropathy after cardiac catheterization in Japanese patients. *Circ J* 2009; 73: 1518-22.
- 2) Goldenberg I, Chonchol M, Guetta V. Reversible acute kidney injury following contrast exposure and the risk of long-term mortality. *Am J Nephrol* 2009; 29: 136-44.
- 3) Gruberg L, Mintz GS, Mehran R, Gangas G, Lansky AJ, Kent KM *et al.* The prognostic implications of further renal function deterioration within 48 h of interventional coronary procedures in patients with pre-existent chronic renal insufficiency. *J Am Coll Cardiol* 2000; 36: 1542-8.
- 4) Cigarroa RG, Lange RA, Williams RH, Hillis LD. Dosing of contrast material to prevent contrast nephropathy in patients with renal disease. *Am J Med* 1989; 86: 649-52.
- 5) Laskey WK, Jenkins C, Selzer F, Marroquin OC, Wilensky RL, Glaser R *et al.* Volume-to-creatinine clearance ratio: a pharmacokinetically based risk factor for prediction of early creatinine increase after percutaneous coronary intervention. *J Am Coll Cardiol* 2007; 50: 584-90.
- 6) Kane GC, Doyle BJ, Lerman A, Barsness GW, Best PJ, Rihal CS. Ultra-low contrast volumes reduce rates of contrast-induced nephropathy in patients with chronic kidney disease undergoing coronary angiography. *J Am Coll Cardiol* 2008; 51: 89-90.
- 7) Ogata N, Ikari Y, Nanasato M, Okutsu M, Kametani R, Abe M *et al.* Safety margin of minimized contrast volume during percutaneous coronary intervention in patients with chronic kidney disease. *Cardiovasc Interv Ther* 2014; 29: 209-15.
- 8) Ali ZA, Karimi Galougahi K, Nazif T, Maehara A, Hardy MA, Cohen DJ *et al.* Imaging- and physiology-guided percutaneous coronary intervention without contrast administration in advanced renal failure: a feasibility, safety, and outcome study. *Eur Heart J* 2016.
- 9) Okura H, Nezu S, Yoshida K. Successful stent implantation guided by intravascular ultrasound and a Doppler guidewire without contrast injection in a patient with allergy to iodinated contrast media. *J Invasive Cardiol* 2011; 23: 297-9.
- 10) Hubbard CR, Blankenship JC, Scott TD, Skelding KA, Berger PB. Emergency pretreatment for contrast allergy before direct percutaneous coronary intervention for ST-elevation myocardial infarction. *Am J Cardiol* 2008; 102: 1469-72.